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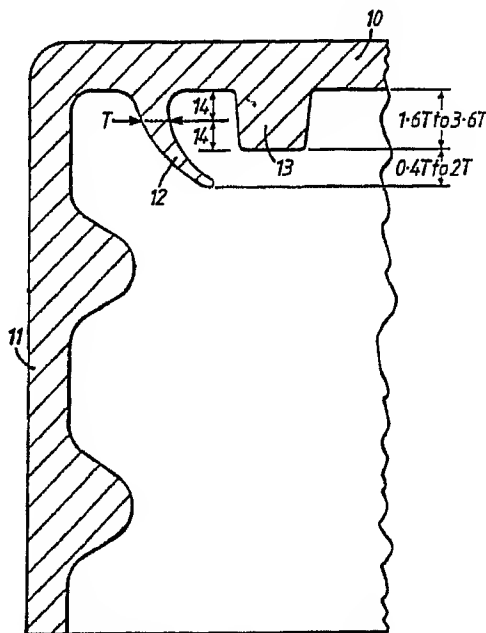
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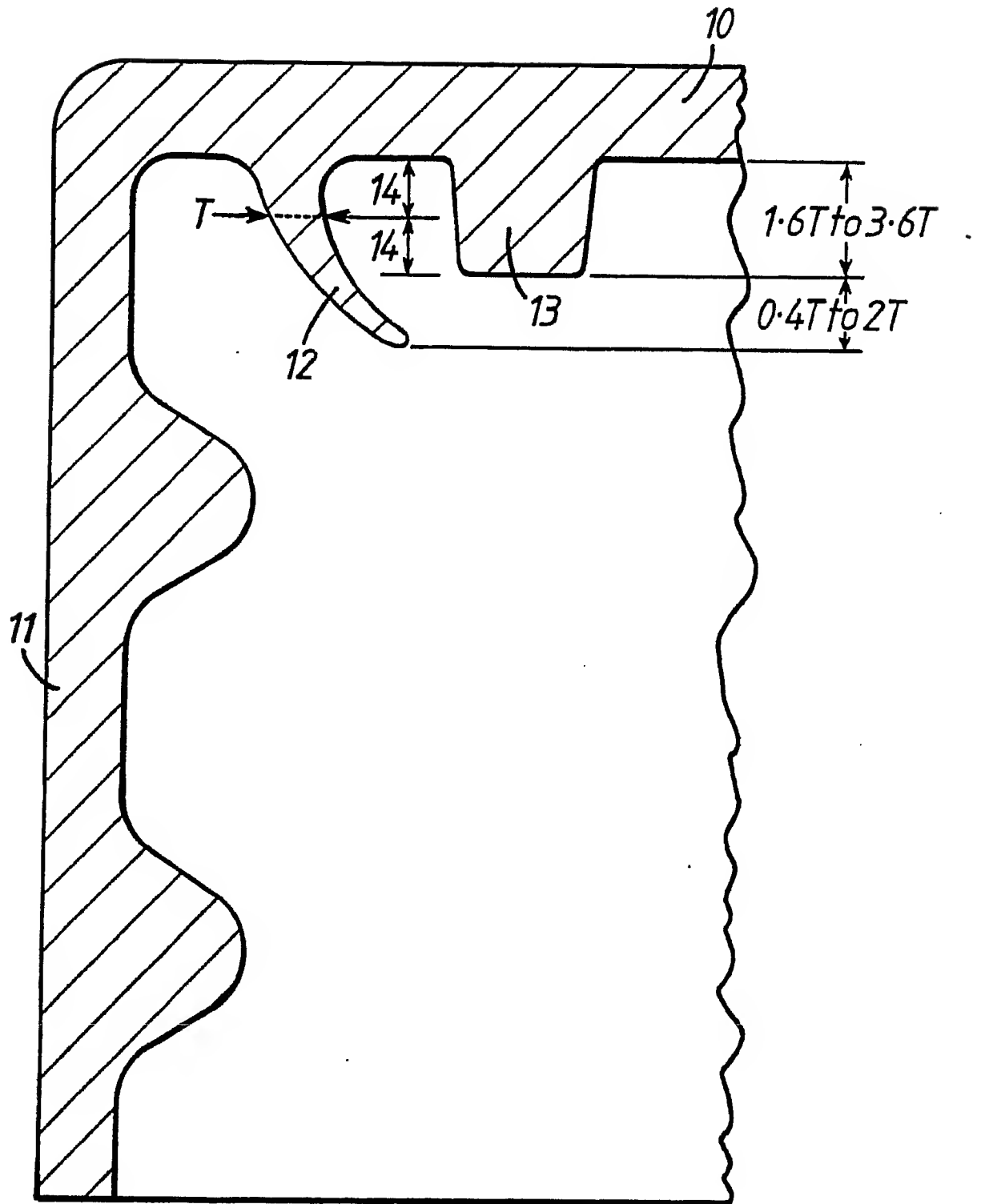
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53/02**

## (54) Closures for releasably sealing containers

(57) A closure for a container having a top portion (10) and a depending skirt (11) for cooperating with the container neck has means for sealing with the container neck, in the form of an annular claw-type sealing element (12) and a juxtaposed stop projection (13) for limiting deformation of the sealing element (12) to minimize loss of resilience thereof. The stop (13) projects from the underside of the top portion by an amount in the range  $1.6T - 3.6T$  and the sealing claw (12) projects beyond the stop (13) by an amount in the range  $0.3T - 2T$ .  $T$  is the wall thickness of the claw (12) at a position midway down the stop (13).



GB 2 222 821



CLOSURES FOR RELEASABLY SEALING CONTAINERS

This invention relates to a closure having a top portion and a skirt depending therefrom for cooperating with a neck portion of a container by means of a screw thread with resilient, annular sealing means being provided on the top portion for sealing against the upper rim of the neck portion of the container when the closure is firmly applied to the container neck portion.

Such a closure is known, for example, from GB-A-788,148 wherein the sealing means is in the form of an annular element which curves inwardly in the downward direction and has a wall thickness which progressively reduces towards the free edge of the sealing element to give it a claw-like form in cross-section. Such a sealing element will hereinafter be referred to as "a claw-type sealing element". As described in GB-A-788,148 the claw-type sealing element is squashed flat between the rim of the container neck and the top portion or crown of the closure to form a seal therebetween. However permanent plastic deformation of the sealing element can take place in practice under such load so that when a stacking load is removed or the cap loosens due to diametric expansion, the sealing element may not be able to maintain its sealing pressure on the rim of the container neck which is necessary to prevent leaks and cap rotation.

The invention seeks to provide an improved container closure having a claw-type sealing element and which is specifically adapted and constructed to minimize loss of resilience of the sealing element due to deformation beyond the elastic limit of the plastics material used.

The invention provides a closure for a container, comprising a top portion, a skirt depending therefrom for

cooperating with a neck portion of the container, and sealing means integral with the closure top portion for sealing against the upper end surface of the container neck portion, said sealing means including a resilient claw-type sealing element and a stop means depending from the underside of said top portion to engage, in use, the upper end surface of the container neck portion thereby to restrict deformation of said sealing element, wherein the stop means projects from said closure top portion by an amount in the range  $1.6T - 3.6T$  and the claw-type sealing element projects downwardly beyond the stop means by an amount in the range  $0.3T - 2T$ , for example in the range  $0.4T - 2T$ , where  $T$  is the wall thickness of the sealing element measured horizontally, that is at right angles to the thread axis, at a level half way between the bottom surface of the stop and the underside of the closure top where it joins the claw seal which as it may not be the same at both sides of the claw, is further defined as the lowest level of the closure underside adjoining the claw seal or its root radius.

Said stop means is preferably in the form of an annular ring extending within and in juxtaposition to said claw-type sealing element.

A stop means having the constructional proportions specified in accordance with the invention provides a means specifically adapted to prevent the deformation of a claw-type sealing element beyond its elastic limit in order to maintain the required sealing function of the sealing element when a top load is removed from the closure or the cap loosens due to diametric expansion.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawing which is a fragmentary cross-sectional view through a closure embodying the invention.

Referring to the drawing, a closure in accordance with the invention, in the form of a cap for cooperation with the threaded neck portion of a jar, is moulded from a suitably resilient plastics material such as polypropylene. The cap

comprises a planar top portion 10 and a tubular depending skirt 11 which is internally screw threaded for threaded engagement with the neck portion of the jar. The cap top portion 10 is provided on its underside, with annular sealing means for sealing against the upper end surface of the neck portion of the jar.

The sealing means comprise a claw-type sealing element 12 which projects downwardly from the underside of the top portion 10. At the root portion of the sealing element 12, its inner and outer curved surfaces join the planar undersurface of the top portion 10 with respective blend radii.

An annular load stop member 13 is also provided on the underside of the closure top portion 10 at a location within the claw-type sealing element and in juxtaposition therewith. When the cap is tightened onto the threaded neck portion of the jar, the claw-type sealing element 12 engages the upper end of the neck portion to seal therewith and is resiliently deformed by such engagement. The resilient deformation of the sealing element 12 is however controlled by the depth of the load stop 13 which is of such bulk that it is substantially incompressible when engaged by the upper end surface of the neck portion of the jar.

In accordance with the invention, the following dimensional relationship is established between the claw-type sealing element 12 and the load stop member 13 in order to achieve a proper functioning of the sealing element 12 by preventing excessive deformation thereof in operation. The load stop member is constructed to project downwardly from the underneath surface of the closure top portion 10 by an amount in the range  $1.6T - 3.6T$  and the sealing element 12 is designed to project downwardly beyond the load stop member 13 by an amount in the range  $0.4T - 2T$ , where  $T$  is the wall thickness of the sealing element measured horizontally at a level equi distant between the bottom contact surface of the stop and closure underside where it joins the claw seal root radius, i.e. spaced therefrom by an

equal distance (14). Although in the specific example given above the range  $0.4T - 2T$  has been selected for the extent of downward projection of the sealing member (12), this downward projection may be in the range of  $0.3T - 2T$  in other embodiments of the invention.

When the jar is filled and the cap applied thereto, the sealing element 12 is compressed against the upper end surface of the neck of the jar by virtue of the cooperating screw threads on the skirt 11 and the neck of the jar and the torque applied during the clamping operation. Capped jars may be subsequently stacked vertically, whereby a considerable top load is exerted on the jars at the bottom of each stack which normally would cause overdeformation of the cap seal 12 which, when the top load is removed, results in the seal no longer contacting the end surface of the jar neck portion and the cap becoming loose allowing leakage and cap rotation. This is prevented by a construction in accordance with the invention which is specifically adapted to prevent or greatly minimize any likelihood of permanent deformation of the claw-type sealing element 12.

CLAIMS

1. A closure for a container, comprising a top portion, a skirt depending therefrom for cooperating with a neck portion of the container, and sealing means integral with the closure top portion for sealing against the upper end surface of the container neck portion, said sealing means including a resilient claw-type sealing element and a stop means depending from the underside of said top portion to engage, in use, the upper end surface of the container neck portion and to restrict deformation of said sealing element, wherein the stop means projects from said closure top portion by an amount in the range  $1.6T - 3.6T$  and the claw-type sealing element projects downwardly beyond the stop means by an amount in the range  $0.3T - 2T$ , where  $T$  is the wall thickness of the sealing element measured horizontally, that is at right angles to the thread axis, at a level half way between the bottom surface of the stop and the underside of the closure top where it joins the claw seal which as it may not be the same at both sides of the claw, is further defined as the lowest level of the closure underside adjoining the claw seal or its root radius.

2. A closure for a container, comprising a top portion, a skirt depending therefrom for cooperating with a neck portion of the container, and sealing means integral with the closure top portion for sealing against the upper end surface of the container neck portion, said sealing means including a resilient claw-type sealing element and a stop means depending from the underside of said top portion to engage, in use, the upper end surface of the container neck portion and to restrict deformation of said sealing element, wherein the stop means projects from said closure top portion by an amount in the range  $1.6T - 3.6T$  and the claw-type sealing element projects downwardly beyond the stop means by an amount in the range  $0.4T - 2T$ , where  $T$  is the wall thickness of the sealing element measured horizontally, that is at right angles to the thread axis, at

a level half way between the bottom surface of the stop and the underside of the closure top where it joins the claw seal which, as it may not be the same at both sides of the claw, is further defined as the lowest level of the closure underside adjoining the claw seal or its root radius.

3. A closure as claimed in Claim 1 or Claim 2 wherein said stop means is in the form of an annular ring extending within and in juxtaposition to said claw-type sealing element.

4. A closure as claimed in any preceding Claim wherein said skirt has an internal screw thread for threadably engaging the neck portion of said container.

5. A closure as claimed in any preceding Claim wherein said claw-type element comprises an annular element which, in cross-section, curves inwardly in the direction towards its free edge and has a thickness which progressively reduces towards its free edge.

6. A closure as claimed in Claim 5 wherein the inner and outer curved side surfaces of said claw-type element join said underside of the top portion of the closure with respective blend radii.

7. A closure for a container, the closure being substantially as hereinbefore described with reference to the accompanying drawing.

Erteilt auf Grund des Ersten Überleitungsgesetzes vom 8. Juli 1949  
(WiGBL S. 175)

BUNDESREPUBLIK DEUTSCHLAND



AUSGEGEBEN AM  
5. JANUAR 1953

DEUTSCHES PATENTAMT

# PATENTCHRIFT

Nr 861 666

KLASSE 81c GRUPPE 15

*E 3071 XII/81c*

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Die Erfinder haben beantragt, nicht genannt zu werden

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Selbsttätiger Verschuß für Tuben und Flaschen

Patentiert im Gebiet der Bundesrepublik Deutschland vom 3. Dezember 1950 an

Patentanmeldung bekanntgemacht am 15. Mai 1952

Patenterteilung bekanntgemacht am 13. November 1952

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Die Erfindung hat sich die Aufgabe gestellt, Tuben und Flaschen mit einem selbsttätigen, unter Federdruck stehenden und mit dem Behälter ortsfest verbundenen Verschuß auszustatten, um ein schnelles Öffnen und Schließen zu ermöglichen und insbesondere bei Tuben zu verhüten, daß die Verschußkappe verlorengeht. Derartige Verschlüsse sind bereits bei Flaschen bekanntgeworden, die im wesentlichen aus einem mit einer Feder zusammenwirkenden Schieber bestehen, der bei Fingerdruck so weit verschoben wird, daß er die Öffnung des Behälters freigibt, wonach bei Nachlassen des Druckes die beim Verschieben des Schiebers gespannte Feder ersteren wieder in seine Schließstellung zurückdrückt. Derartige Schieberverschlüsse sind jedoch verhältnismäßig kompliziert und teuer, wodurch sie insbesondere für Tuben wegen deren einmaliger Verwendung nicht anwendbar sind. Darüber hinaus macht sich auch bei derartigen Schieberverschlüssen der Nachteil geltend, daß zu ihrer Betätigung ein gewisser Hub erforderlich ist, wodurch sie auf eine solche Länge aus dem Behälter hinausragen, daß sich deren Verpackung sperrig gestaltet. Vor allem aber weisen derartige Verschlüsse den Nachteil auf, daß bei unbeabsichtigtem Druck auf den Schieber, beispielsweise beim Transport oder beim Umstürzen des Behälters, dieser in die Offenstellung gleitet und damit insbesondere flüssigem Inhalt des Behälters die Möglichkeit bietet, auszulaufen. Um den Schieber einfacher zu gestalten, hat man bereits vorgeschlagen, diesen in Ersetzung der Feder aus nachgiebigem, zusammendrückbarem Werkstoff, beispielsweise Kautschuk, herzustellen. Das Kautschukstück verschließt sodann in seiner Ruhestellung die Behälteröffnung, während es beim Zusammendrücken die Öffnung freigibt. Derartige Verschlüsse gewährleisten jedoch keinen einwandfreien Verschuß des Behälters, abgesehen davon, daß sie auch unbeabsichtigtem Druck ausgesetzt sind.

Diese Nachteile zu beseitigen ist das Ziel der Erfindung, die darin besteht, daß die auf dem Tuben- oder Flaschenhals sitzende Verschußkappe als Schieber ausgebildet ist, und zwar derart, daß die Verschußkappe, die unter der Spreizwirkung einer auf dem geschlossenen Hals der Tube oder Flasche gelagerten Feder steht, bei seitlichem Druck auf einen nasenartigen Ansatz sich auf dem Hals des Behälters bis zur Freigabe einer an der Halswand befindlichen Öffnung dreht und bei nachlassendem Druck durch die Wirkung der vorher gespannten Feder wieder in die Schließstellung federt und dabei die Öffnung in der Halswand schließt.

Der erfindungsgemäß gestaltete Verschuß ist besonders durch die Lagerung seiner Feder einfach in seinem Aufbau und läßt sich dadurch, daß zur

Freigabe der Öffnung in der Halswand des Behälters eine Drehbewegung des Verschlusses erforderlich ist, unbeabsichtigt nicht verstellen. Er gestattet darüber hinaus auch bei Tuben, deren Inhalt vor Entnahme unter Druck gesetzt ist, einhändige Betätigung, was insbesondere von Einarmigen als angenehm empfunden werden wird.

In der Zeichnung ist die Erfindung an einer Tube veranschaulicht, und zwar zeigt diese

Abb. 1 in Ansicht, teilweise im Längsschnitt, mit in der Offenstellung befindlicher Verschußkappe, und

Abb. 2 und 3 im Schnitt nach der Linie *a-a* und *b-b* der Abb. 1; --

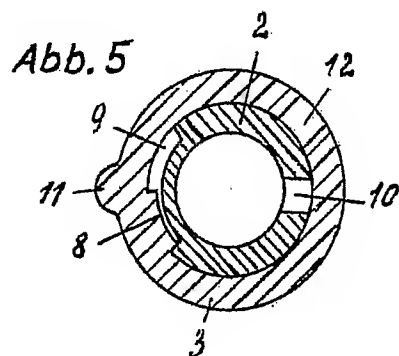
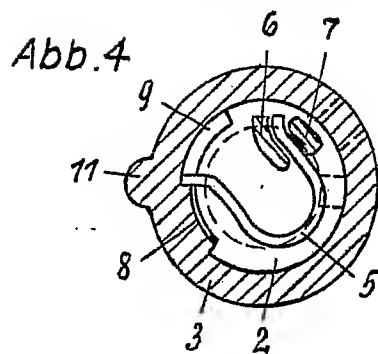
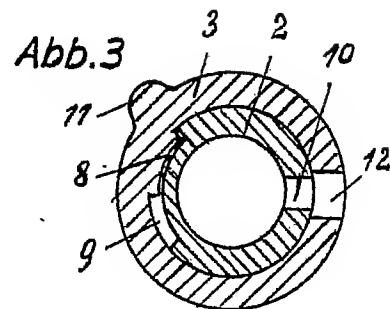
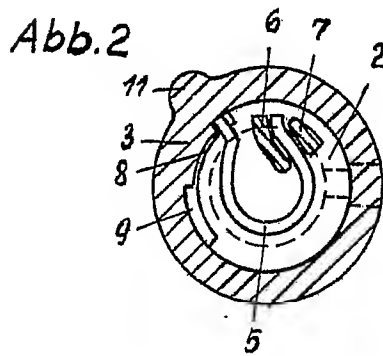
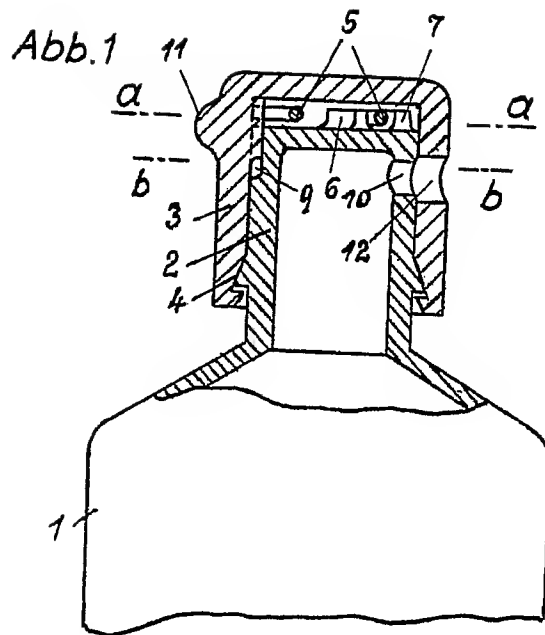
Abb. 4 und 5 stellen die gleichen Schnitte dar, jedoch mit in der Schließstellung befindlicher Verschußkappe.

Mit 1 ist die Tube und mit 2 deren Hals bezeichnet, auf dem die Verschußkappe 3 sitzt, die beispielsweise aus Kunststoff hergestellt, zufolge ihrer Eigenfederung einen ringförmigen Absatz 4 des Halses 2 untergreift und dadurch vor Abzug von letzterem gesichert ist. Die Verschußkappe 3 steht unter der Spreizwirkung einer auf dem geschlossenen Hals 2 gelagerten Feder 5, die sich mit ihrem einen Ende zwischen Halterungen 6, 7 ihrer Lagerstelle und mit ihrem anderen Ende an einen Absatz 8 der Verschußkappe 3 abstützt, der sich in einer Ausnehmung 9 des Halses 2 der Tube 1 zur Begrenzung der Drehbewegung der Verschußkappe 3 führt. Mit 10 ist eine Öffnung in der Wand des Halses 2 bezeichnet, vor die sich die Verschußkappe 3 bei Druck auf einen nasenartigen Ansatz 11 mit einer Öffnung 12 legt, um bei nachlassendem Druck auf den nasenartigen Ansatz 11 durch die vorher gespannte Feder 5 wieder in die Schließstellung gedrückt zu werden.

#### PATENTANSPRUCH:

Selbsttätiger Verschuß für Tuben und Flaschen, wie solche aus einem mit einer Feder zusammenwirkenden Schieber bestehen, der bei Fingerdruck gegen den Federdruck so weit verschoben wird, daß er die Öffnung des Behälters freigibt, gekennzeichnet durch die Verwendung einer auf dem Tuben- oder Flaschenhals sitzenden Verschußkappe (3) als Schieber, die unter der Spreizwirkung einer auf dem geschlossenen Hals (2) der Tube (1) oder Flasche gelagerten Feder (5) steht, bei seitlichem Druck auf einen nasenartigen Ansatz (11) sich auf dem Hals (2) des Behälters bis zur Freigabe einer an der Halswand befindlichen Öffnung (10) dreht und bei nachlassendem Druck durch die Wirkung der vorher gespannten Feder (5) wieder in die Schließstellung federt und dabei die Öffnung (10) in der Halswand der Tube (1) oder Flasche schließt.

Hierzu 1 Blatt Zeichnungen



①9 BUNDESREPUBLIK DEUTSCHLAND



①2

## Gebrauchsmuster

U 1

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(54) Bezeichnung des Gegenstandes  
Verschluß

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14.10.85

4

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13. Dezember 1985

Sg-DB/my

Verschluß

Die Erfindung bezieht sich auf einen Verschluß für einen flaschen- oder dosenartigen Behälter mit einer aus Seitenwand und Oberwand bestehenden Kappe, die mittels eines Scharniergelenkes an einem Mündungsstück klappbar befestigt ist.

Es ist bekannt, daß eine Reihe von Substanzen, die täglich im Haushalt verwendet werden, für Kinder äußerst gefährlich sind. In erster Linie handelt es sich um Medikamente, Reinigungsmittel, Insektizide und ähnliche aggressive und gesundheitsschädliche Medien. Zum Schutz gegen solche meistens flüssigen Mittel sind vielfältige Versuche zur Schaffung kindersicherer Verschlüsse unternommen worden. Bekannte derartige Verschlüsse bestehen aus einem Schraubdeckel, mit dem eine an ihrer Seitenwand nachgiebige Sicherungskappe unverlierbar verbunden ist, die in unverformtem Zustand relativ zum Schraubdeckel frei verdrehbar ist, so daß dieser sich nicht

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- 2 -

abschrauben läßt. Nur wenn man den Wirkungszusammenhang kennt und die Seitenwand der Sicherungskappe radial zusammendrückt, wird bei ihrer Drehung der Schraubdeckel mitgenommen und läßt sich auf- oder abschrauben.

05 Zur Verbesserung der Kraftübertragung von der verformten Sicherungskappe auf den Schraubdeckel dienen beispielsweise zusammengreifende Rändelungen (DE-OS 22 54 688) und radiale Vorsprünge (DE-OS 24 31 060). Es hat sich gezeigt, daß solche Schraubverschlüsse für den

10 täglichen Gebrauch unbequem sind, weil das Aufschrauben und Abschrauben umständlich ist und weil sowohl bei nasser und glitschiger Verschmutzung des Zwischenraumes zwischen Schraubdeckel und Sicherungskappe als auch bei Eindringen von festen Partikeln und hartwerdenden Massen in den Zwischenraum die bestimmungsgemäße Funktion des Verschlusses in Frage gestellt ist. Im ersten Falle besteht durch nicht kraftschlüssigen Zusammengriff von

15 Sicherungskappe und Schraubdeckel die Gefahr, daß der unsichtbare Schraubdeckel nicht oder nur teilweise auf dem Behälter aufgeschraubt wird, so daß sein Inhalt für Kinder frei zugänglich ist. Ferner wird das gewollte Öffnen des Verschlusses zumindest erschwert. Im zweiten Falle bleiben Sicherungskappe und Schraubdeckel immer drehfest miteinander verbunden und die Kindersicherung

20 ist unwirksam.

25

Da im Haushalt die geschilderten Einflüsse nicht ausgeschlossen werden können, eignen sich die bekannten Schraubverschlüsse nicht uneingeschränkt und der Erfindung liegt die Aufgabe zugrunde, einen Verschuß, der

30 kein Schraubverschluß ist, mit einer zuverlässigen Kindersicherung auszustatten.

Diese Aufgabe wird bei einem Verschuß mit einer aus

35 Seitenwand und Oberwand bestehenden Kappe, die mittels

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eines Scharniergelenkes an einem Mündungsstück klappbar befestigt ist, dadurch gelöst, daß gegenüber dem Scharniergelenk an der Oberseite des Mündungsstückes ein nach oben und außen gerichteter Rastvorsprung einer  
05 Zuhaltung vorgesehen ist, der mit einem nach innen gerichteten Gegenorgan an der Seitenwand der Kappe lösbar zusammengreift und daß die Seitenwand der Kappe elastisch verformbar und durch radiales Zusammendrücken an zwei einander gegenüberliegenden Abschnitten in Rich-  
10 tung der Zuhaltung auslenkbar ist.

Ein solcher Verschuß hat den Vorteil, daß er sich bei Kenntnis des Auslösemechanismus durch einfaches Aufklappen bzw. Zuklappen rasch und komplikationslos betätigen läßt, daß jedoch Kinder den Verschuß nicht öffnen können, weil es ihnen nicht gelingt, die Zuhaltung zu entriegeln. Jede Kraftausübung zum Abziehen der Kappe ohne gezielte Zusammendrückung der Seitenwand führt zu einer Verstärkung des Zusammengriffs von Rastvorsprung und Gegenorgan und der Öffnungsversuch mißlingt.  
15 Weder Seife oder ähnliche klebende bzw. glitschige Stoffe noch feste Teile können die Funktionsfähigkeit der Kindersicherung oder der klappbaren Kappe beeinträchtigen, so daß der Verschuß für Behälter zur Aufnahme von Reinigungsmitteln und anderen ggf. aggressiven Medien des Haushaltsbedarfs besonders gut geeignet ist.  
20  
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In vorteilhafter Ausgestaltung der Erfindung ist vorgesehen, daß die Seitenwand der Kappe im Bereich der beiden Abschnitte konvex gewölbt ist und daß die Abschnitte in bezug auf die Oberseite des Mündungsstückes in radialer Richtung frei verschiebbar sind. Die freie radiale Verschiebbarkeit der konvex gewölbten Abschnitte kann  
30  
35 dadurch erzielt werden, daß die Oberseite des Mündungs-

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- 4 -

05 stückes bis auf den nach oben vorstehenden Rastvorsprung überstandslos und ebenflächig ist. Falls dies aus herstellungs- oder anwendungstechnischen Gründen nicht günstig sein sollte und zur Verhinderung seitlicher Verschiebung der Kappe die Oberseite des Mündungsstückes eine äußere Ringfläche zur Anlage des Randes der Kappe und einen inneren, erhabenen Teil aufweist, ist es erforderlich, daß der erhabene Teil im Bereich der beiden konvexen Abschnitte der Seitenwand der Kappe nach innen soweit zurückgesetzt ist, wie zur ungehinderten Eindrückung der Abschnitte erforderlich.

15 Zweckmäßigerweise sind die Kappe und das Mündungsstück rund, insbesondere kreisförmig, und es ist vorgesehen, daß die Seitenwand der Kappe im Bereich des Gegenorgans abgeflacht und das Rastorgan zu dem Umfang des Mündungsstückes entsprechend nach innen zurückgesetzt ist. Damit wird das Untergreifen dieser Kappenpartie mit dem Fingernagel oder einem scharfen Gegenstand zur Öffnung der Kappe ohne ordnungsgemäße Entriegelung der Zuhaltung praktisch unmöglich gemacht. Die Kindersicherung funktioniert auch mit einer ovalen oder mehreckigen Form von Mündungsstück und Kappe. Als Rastvorsprung und Gegenorgan können leistenförmige Teile dienen, deren 20 Zusammengriff sich bei leichter seitlicher Verschiebung der Kappe auf dem Mündungsstück nicht löst.

30 Von der Oberseite des Mündungsstückes steht eine zentrale Tülle senkrecht ab und an der Innenfläche der Oberwand der Kappe ist ein zentraler Verschußteil für die Tüllenöffnung angeordnet. Die Tülle kann eine Spritzdüse oder Gießöffnung aufweisen und der Verschußteil kann ein in die Tüllenöffnung hineinragender Stopfen oder eine diese überfangende Hülse sein.

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Es ist vorgesehen, daß das Mündungsstück und die Kappe aus Kunststoff hergestellt sind und daß das Scharniergelenk ein selbstschließendes Bandscharnier ist. Das Bandscharnier weist eine breite Mittellasche und zwei  
05 sie flankierende Seitenlaschen auf, die jeweils mit der Kappe und dem Mündungsstück verbunden sind und deren Länge so bemessen ist, daß die Kappe bei Verschwenkung über den Totpunkt in die Offenstellung bzw. Schließstellung gedrückt wird.

10

Das Mündungsstück kann an den Hals eines Behälters angeformt sein. Zur Steigerung der Einsatzmöglichkeiten des Verschlusses ist jedoch zweckmäßigerweise das Mündungsstück als Schraubkörper ausgebildet, der auf ein  
15 Außengewinde an dem Behälter aufschraubbar ist.

In der Zeichnung ist ein Ausführungsbeispiel der Erfindung schematisch dargestellt. Es zeigen:

20 Fig. 1 eine perspektivische Ansicht des geschlossenen Verschlusses,

Fig. 2 eine perspektivische Ansicht des Öffnungsvorganges des Verschlusses,

25 Fig. 3 eine perspektivische Ansicht des geöffneten Verschlusses,

Fig. 4 einen senkrechten Schnitt durch den geschlossenen Verschuß gemäß Fig. 1,

Fig. 5 einen senkrechten Schnitt durch den geöffneten Verschuß, und

30 Fig. 6 eine Draufsicht auf die Anordnung nach Fig. 5.

Ein flaschenartiger Behälter 1 aus Kunststoff ist über eine Schulterpartie 2 mit einem Hals ausgestattet, der  
35 eine Öffnung enthält und auf seinem Außenumfang ein

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Außengewinde aufweist. Auf das Außengewinde ist ein ringförmiges Mündungsstück 4 eines Verschlusses 5 aufgeschraubt und auf beliebige Weise gegen Rückdrehung gesichert. Das Mündungsstück 4 ist auf seinem Außenumfang mit einer senkrechten Rändelung 3 versehen und weist an seinem Innenumfang ein Innengewinde 6 auf, das mit dem Außengewinde des Behälterhalses zusammenwirkt. Alternativ kann das ringförmige Mündungsstück an den Hals des Behälters 1 fest angeformt sein, so daß Gewinde und Rückdrehsicherung entfallen. An dem oberen Rand des Mündungsstückes 4 ist ein Bandscharnier 7 befestigt, das das Mündungsstück 4 mit einer Kappe 8 des Verschlusses klappbar verbindet. Das Bandscharnier besteht aus einer breiten knickbaren Mittellasche 31, die von je einer schmaleren Seitenlasche 32 flankiert ist. Die Seitenlaschen 32 sind länger als die Mittellasche 31 und weisen eine gebogene Partie 32a auf, die je nach Stellung der Kappe 8 umspringt. Das Bandscharnier 7 ist durch Übertotpunkteffekt selbstschließend bzw. läßt die Kappe 8 während der Öffnung in volle Öffnungsposition schnellen.

Die Kappe 8 besitzt eine kreisförmige Oberwand 9, von deren Umfang eine im wesentlichen senkrecht gerichtete, geschlossene Seitenwand 10 ausgeht. Die Seitenwand 10 ist elastisch verformbar und verläuft bis zu einem dem Bandscharnier 7 gegenüberliegenden abgeflachten Bereich 10a im wesentlichen kreisförmig. Der abgeflachte Bereich 10a beginnt mit Abstand unter der Oberwand 9, wodurch eine Griffnase 28 entsteht. Er trägt auf seiner Innenfläche in der Nähe des freien Randes 12 der Seitenwand 10 eine Leiste 11, die zu dem Rand 12 parallel verläuft und deren der Oberwand 9 zugewandte Fläche 11a senkrecht zu dem abgeflachten Bereich 10a gerichtet ist. Die Länge der Leiste 11 entspricht etwa der Breite

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des Bereiches 10a. Zwei einander gegenüberliegende konvexe Abschnitte 10b der Seitenwand 10 sind auf der Außenfläche aufgerauht oder geriffelt und dienen als Angriffsfläche für zwei Finger (Fig. 2).

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Auf der Innenfläche der Oberwand 9 sind zwei parallele plattenförmige Stege 13, 14 angeordnet, die sich zwischen den Seiten des abgeflachten Bereiches 10a und dem Bandscharnier 7 erstrecken und mit Abstand zu der Seitenwand 10 enden. Die Stege 13, 14 versteifen die Oberwand 9. Im Zentrum der Oberwand 9 befindet sich ein hohler Stopfen 15, dessen Rand 15a von vorne nach hinten schräg abfällt.

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Die Leiste 11 an der Kappe 8 dient als Gegenorgan für einen Rastvorsprung 20 in Form einer nach außen abgewinkelten Leiste etwa gleicher Länge, der von ihr untergriffen wird (Fig. 4). Der Rastvorsprung 20 ist auf der Oberseite des Mündungsstückes 4 vorgesehen und zu

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dessen kreisförmigem Außenumfang nach innen soweit zurückgesetzt, wie der abgeflachte Bereich 10a der Seitenwand 10 der Kappe 8 verlangt. Die Oberseite des Mündungsstückes 4 ist profiliert und weist eine umfangsmäßige Ringfläche 21 und einen inneren erhabenen Teil 22

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auf, der konkav kegelförmig geschwungen in eine zentrale Tülle 23 übergeht, die in einem Gieß- oder Tropfrand 24 endet. Von der Innenfläche der Oberseite des Mündungsstückes 4 ragt eine Schürze 30 nach unten. Diese

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stabilisiert die Oberseite und den Rastvorsprung 20. Im scharnierseitigen hinteren Bereich folgt der erhabene Teil 22 dem Kreisbogenverlauf, geht dann in zwei parallele gerade Ränder 25 über und erhält nach kurzen Rundungstrecken 26 einen geraden Abschluß 27, der zu dem Außenumfang des Mündungsstückes 4 nach innen zurückge-

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setzt und zum Bereich 10a der Kappe 8 parallel ist.

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Bei geschlossener Kappe 8 sitzt ihr Rand 12 auf der Ringfläche 21 des Mündungsstückes 4 auf und der Rastvorsprung 20 wird von dem Gegenorgan 11 einrastend untergriffen (Fig. 4). Der Stopfen 15 greift in die Mündung der Tülle 23 abdichtend ein (Fig. 4). Zur Öffnung des Verschlusses werden die beiden Abschnitte 10b der Kappe 8 wie in Fig. 2 gezeigt radial zusammengedrückt, wodurch die Seitenwand 10 so deformiert wird, daß der abgeflachte Bereich 10a nach außen weggedrückt wird und das Gegenorgan 11 von dem Rastvorsprung 20 freikommt. Die Kappe 8 kann sodann um das Scharniergelenk 7 verschwenkt werden und die Öffnung 15a ist frei.

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A N S P R Ü C H E

05 1. Verschluß für einen flaschen- oder dosenartigen Behälter mit einer aus Seitenwand und Oberwand bestehenden Kappe, die mittels eines Scharniergelenkes an einem Mündungsstück klappbar befestigt ist,

dadurch gekennzeichnet, daß gegenüber dem Scharniergelenk (7) an der Oberseite des Mündungsstückes (4) ein nach oben und außen gerichteter Rastvorsprung (20) einer Zuhaltung vorgesehen ist, der mit einem nach innen gerichteten Gegenorgan (11) an der Seitenwand (10) der Kappe (8) lösbar zusammengreift und daß die Seitenwand (10) der Kappe (8) elastisch verformbar und durch radiales Zusammendrücken an zwei einander gegenüberliegenden Abschnitten (10b) in Richtung der Zuhaltung auslenkbar ist.

2. Verschluß nach Anspruch 1, dadurch gekennzeichnet, daß die Seitenwand (10) der Kappe (8) im Bereich für beiden Abschnitte (10b) konvex gewölbt ist und daß die Abschnitte (10b) in bezug auf die Oberseite des Mündungsstückes (4) in radialer Richtung frei verschiebbar sind.

25 3. Verschluß nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Kappe (8) und das Mündungsstück (4) rund, insbesondere kreisförmig sind und daß die Seitenwand (10) der Kappe (8) im Bereich (10a) des Gegenorgans (11) abgeflacht und der Rastvorsprung 20 zu dem Umfang des Mündungsstückes (4) entsprechend nach innen zurückgesetzt ist.

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4. Verschuß nach einem der Ansprüche 1 bis 3,  
dadurch gekennzeichnet, daß  
von der Oberseite des Mündungsstückes (4) eine zentrale  
Tülle (23) senkrecht absteht und daß an der Innenfläche  
05 der Oberwand (9) der Kappe (8) ein zentraler Verschuß-  
teil (15) für die Tüllenöffnung angeordnet ist.

5. Verschuß nach einem der Ansprüche 1 bis 4,  
dadurch gekennzeichnet, daß  
10 das Mündungsstück (4) und die Kappe (8) aus Kunststoff  
hergestellt sind und daß das Scharniergelenk (7) ein  
selbstschließendes Bandscharnier ist.

6. Verschuß nach einem der Ansprüche 1 bis 5,  
15 dadurch gekennzeichnet, daß  
das Mündungsstück (4) als Schraubkörper ausgebildet  
ist, der auf ein Außengewinde an dem Behälter (1) auf-  
schraubbar ist.

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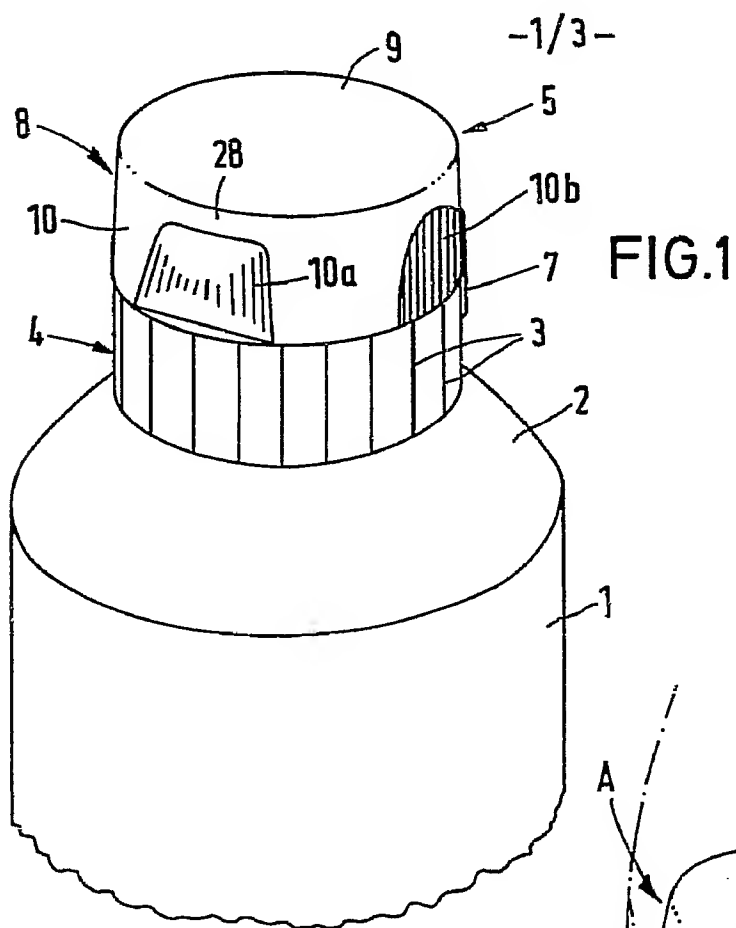
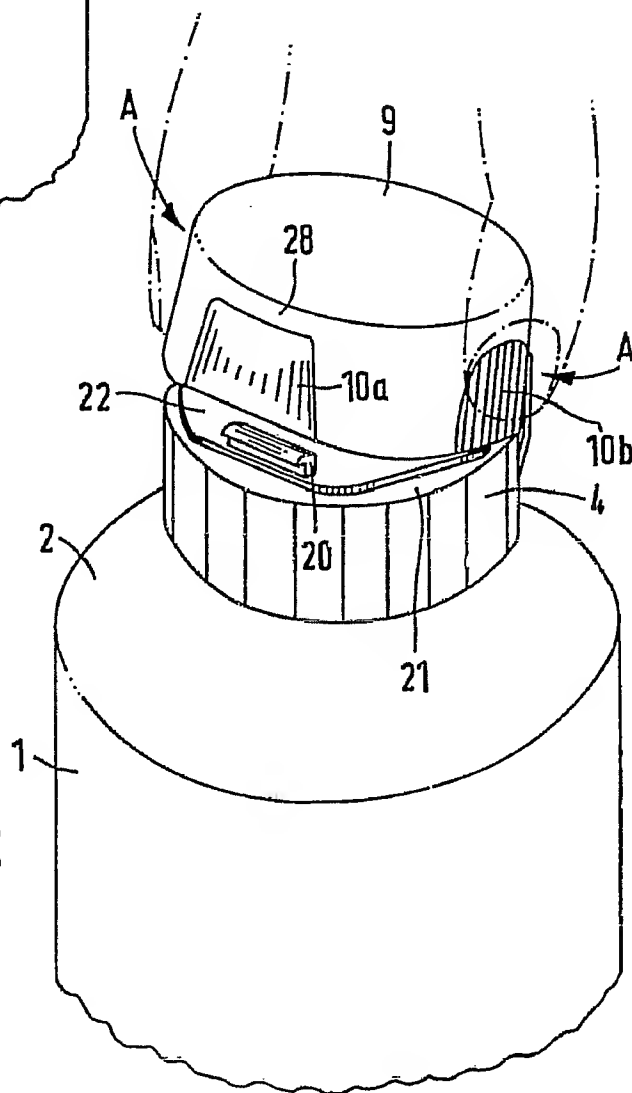


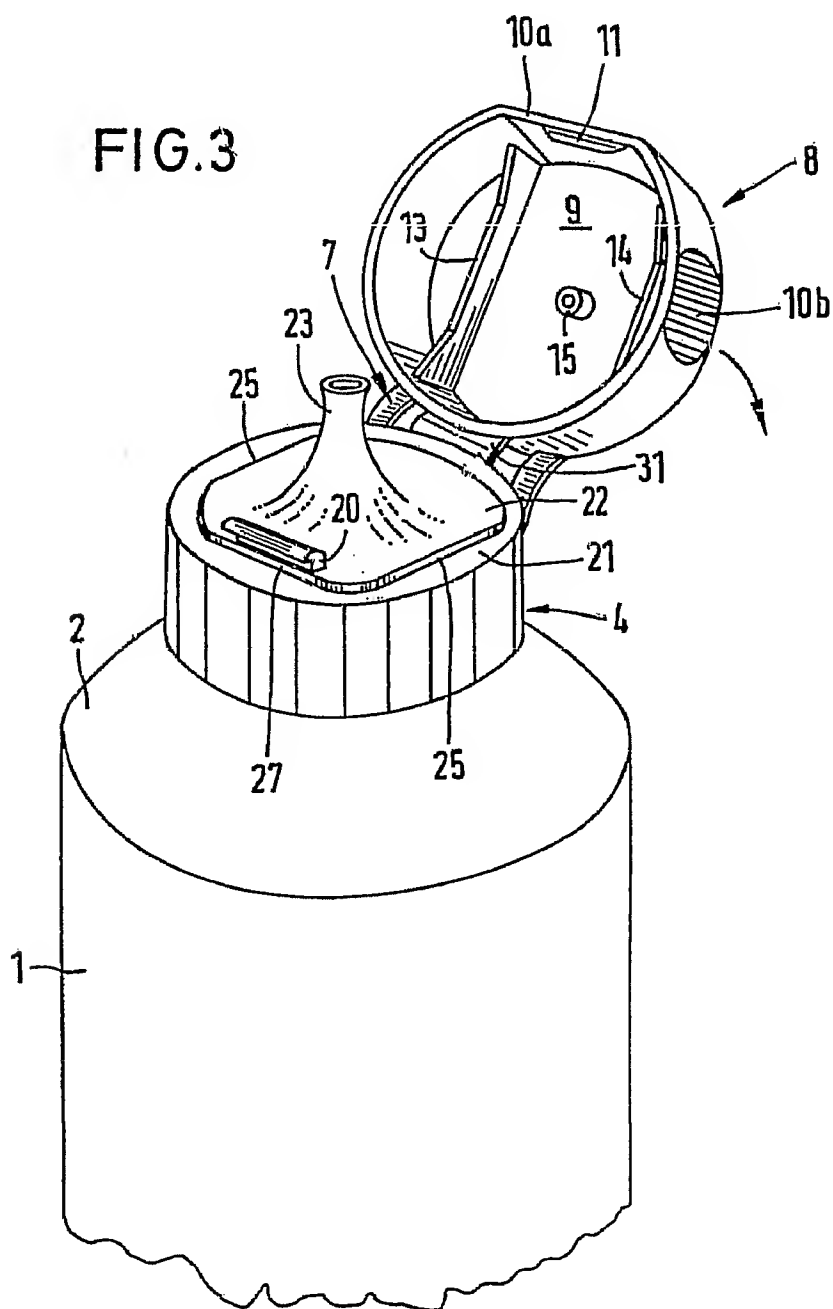
FIG. 2



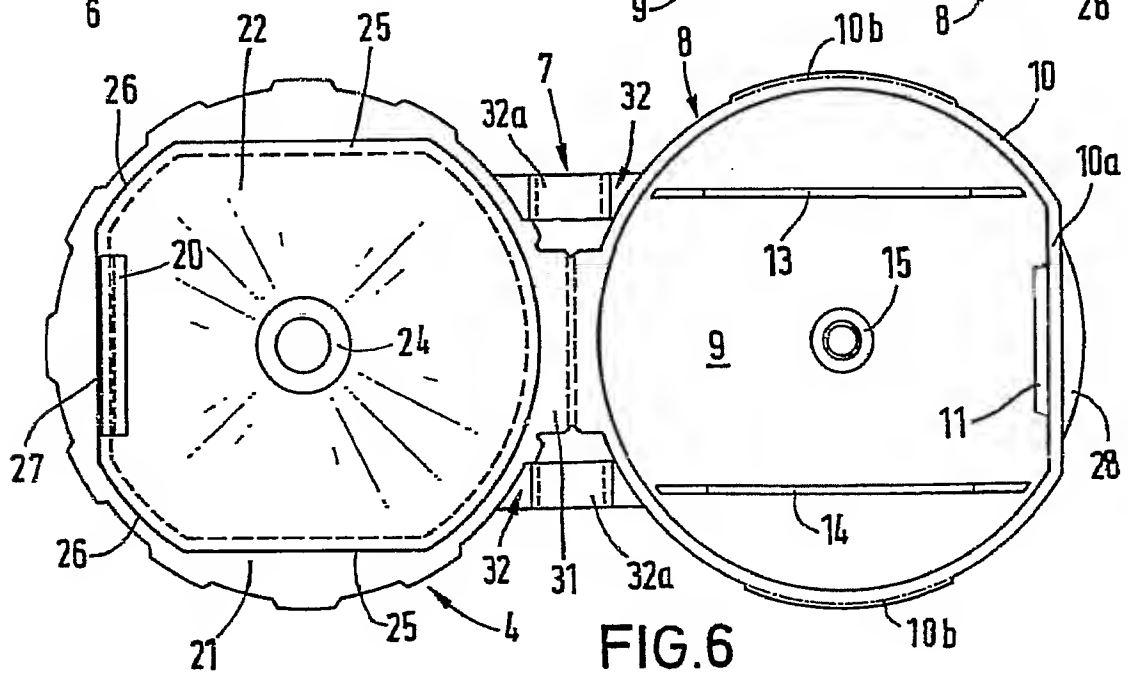
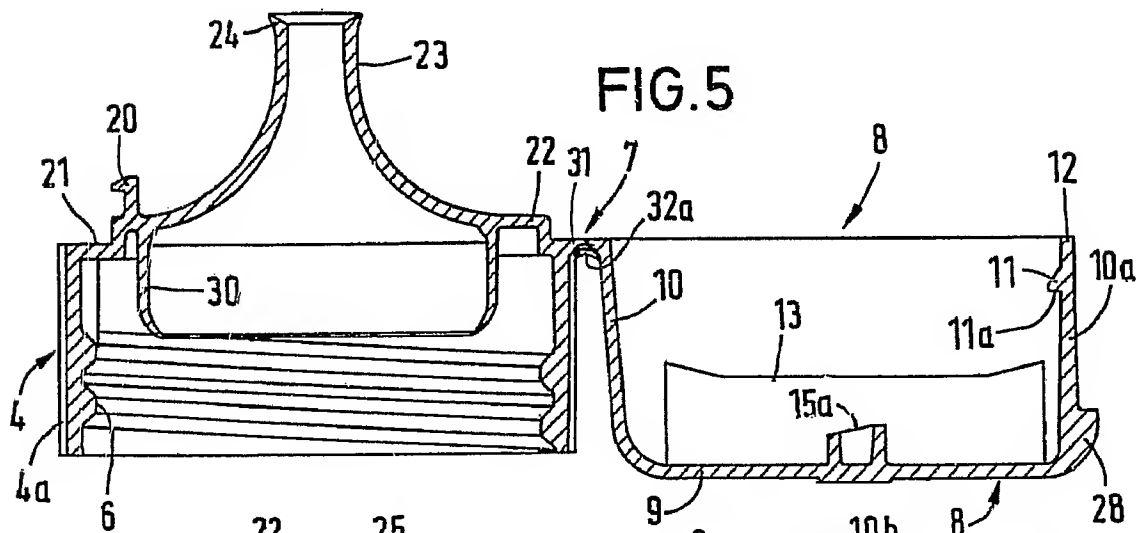
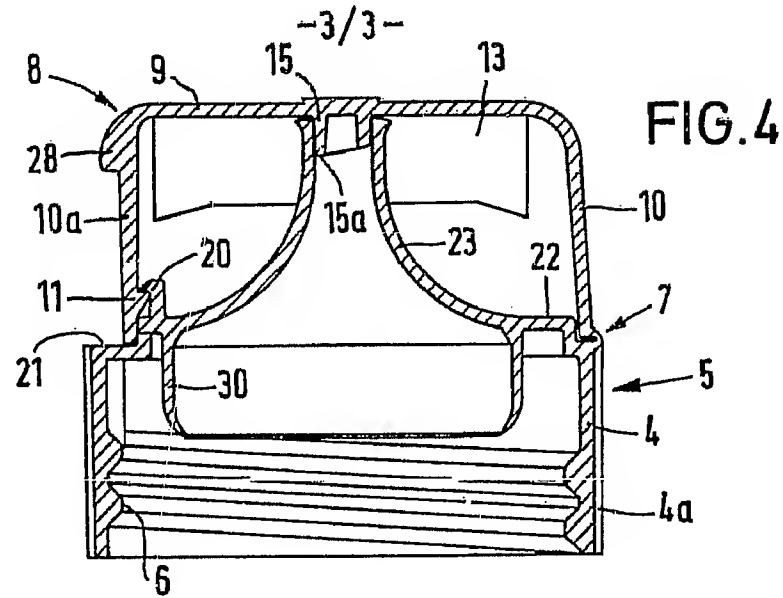
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FIG.3



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DEUTSCHES  
PATENTAMT

②1 Aktenzeichen: P 36 05 963.3  
②2 Anmeldetag: 25. 2. 86  
④3 Offenlegungstag: 27. 8. 87

Behördereigentum

DE 3605963 A1

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Antrag auf Nichtnennung

See US 4,493,427

⑤4 Sicherheits-Behälterverschluß

Ein Sicherheits-Behälterverschluß mit einer nur unter Anwendung einer zusätzlichen Öffnungstätigkeit abschraubbaren, also mit Kindersicherung ausgestatteten Schraubverschlußkappe und einer mit Abreibring ausgestatteten Originalitäts-Sicherungseinrichtung wird dahingehend verbessert, daß ein getrennt herstellbarer und in die Innenkappe der Schraubverschlußkappe einsetzbarer Originalitäts-Sicherungsring vorgesehen wird, der einen Abreibring und einen über Abreibelemente mit ihm verbundenen Mitnahmering enthält, wobei der Mitnahmering nur mit sich in Abschraubsinn axial verhakenden Rasteinrichtungen in Kraftschlußverbindung mit der Innenkappe steht. Zusätzlich kann ein Reibungs-Kraftschluß zwischen dem Bund des Behälterhalses über den Mitnahmering des Originalitäts-Sicherungsringes auf die Innenkappe der Schraubverschlußkappe gebildet werden, der die Funktion der Kindersicherung an der Schraubverschlußkappe sicherer macht. Dabei ist aber der Abreibring außerhalb dieses Reibungs-Kraftschlusses zu halten.

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1. Sicherheits-Behälterverschluß mit Schraubverschlußkappe und erstmaliges Öffnen anzeigender Originalitäts-Sicherungseinrichtung, bei dem die Schraubverschlußkappe eine die eigentlichen Verschlußbelemente und Gewindeteile aufweisende Innenkappe, eine als Betätigungselement ausgebildete Außenkappe und eine zwischen Innenkappe und Außenkappe angeordnete Drehmoment-Übertragungseinrichtung aufweist, die nur unter Ausübung einer zusätzlichen Öffnungstätigkeit, beispielsweise Ausübung von axialem Druck, durch den Benutzer in Eingriff zu bringen und zu halten ist, während die Originalitäts-Sicherungseinrichtung einen durch axialen Zug abtrennbaren Abreißring aufweist, der unter einen Bund an dem die Behälteröffnung aufweisenden und den Behälterverschluß tragenden Behälterhals greift, **dadurch gekennzeichnet**, daß der Abreißring (27) an einem von der Schraubverschlußkappe (11) getrennten Originalitäts-Sicherungsring (24) ausgebildet ist, der den Bund (30) am Behälterhals (22) umgibt und selbst vom freien Randbereich (25) der Innenkappe (13) umgeben ist, wobei der Originalitäts-Sicherungsring (24) einen über auf axialen Zug ansprechende Abreißbelemente (29) an den Abreißring (27) angeschlossenen Mitnahmering (26) enthält, der über sich in Abschraub-sinn der Schraubverschlußkappe (11) lediglich axial verhakende Rasteinrichtungen (32, 33) in Kraftschluß-Verbindung mit der Innenkappe (13) steht.
2. Sicherheits-Behälterverschluß nach Anspruch 1, dadurch gekennzeichnet, daß die Innenkappe (13) an der Innenfläche ihres Randbereiches (25) einen Rastring (32) mit nach dem Kappenrand zu flach verlaufendem, dreieckigem Querschnitt und der Mitnahmering (26) eine im wesentlichen in einer Normalebene zur Verschlußachse liegende, auf den Abreißring (27) zu gerichtete Rastschulter (33) aufweisen.
3. Sicherheits-Behälterverschluß nach Anspruch 2, dadurch gekennzeichnet, daß die Innenfläche der Innenkappe (13) innerhalb des Rastringes (32) zu passendem Sitz des von der Innenkappe (13) aufgenommenen Mitnahmeringes (26) ausgebildet ist.
4. Sicherheits-Behälterverschluß nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß der Abreißring (27) mit einer axial auf die Innenkappe (13) zu gerichteten Aufsetzschulter (38) für den Stirnrand (29) der Innenkappe (13) ausgebildet ist.
5. Sicherheits-Behälterverschluß nach Anspruch 3 und 4, dadurch gekennzeichnet, daß der Rastring (32) mit einer auf das Innere der Innenkappe (13) zu gerichteten steilen Abschrägung (35) zum axialen Einziehen des Originalitäts-Sicherungsringes (24) in die Innenkappe (13) unter fester Anlage an die innerhalb des Rastringes (32) gebildeten Innenflächenteile (36, 37) der Innenkappe (13) und feste Anlage der Aufsetzschulter (38) an den Stirnrand (39) der Innenkappe (13) ausgebildet ist.
6. Sicherheits-Behälterverschluß nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß der Abreißring (27) durch einen sich ringsum erstreckenden, nur von einer Anzahl von ringsum verteilten Verbindungs- und Abreißbelementen (29) überbrückten Schlitz (28) vom Mitnahmering (26) getrennt ist.

7. Sicherheits-Behälterverschluß nach Anspruch 6, dadurch gekennzeichnet, daß die Verbindungs- und Abreißbelemente (29) als an der Innenfläche des Originalitäts-Sicherungsringes (24) vorstehende, sich auf die Umfangsfläche des Bundes (30) am Behälterhals (22) aufsetzende Rippen ausgebildet sind.
8. Sicherheits-Behälterverschluß nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß der Abreißring (27) in seinem Inneren mit einem unter den Bund (30) des Behälterhalses (22) greifenden Haltekragen (31) mit widerhakenartigem Querschnitt ausgebildet ist.
9. Sicherheits-Behälterverschluß nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß die Außenkappe (12) der Schraubverschlußkappe (11) an ihrem Öffnungsrand einen sich ringsum erstreckenden Schutzkragen (40) aufweist, der den den Originalitäts-Sicherungsring (24) aufnehmenden Randbereich (25) der Innenkappe (13) umgibt und ggf. auch den Abreißring (27) des Originalitäts-Sicherungsringes (24) ganz oder teilweise abdeckt.

### Beschreibung

Die Erfindung betrifft einen Sicherheits-Behälterverschluß mit Schraubverschlußkappe und erstmaliges Öffnen anzeigender Originalitäts-Sicherungseinrichtung, bei dem die Schraubverschlußkappe eine die eigentlichen Verschlußbelemente und Gewindeteile aufweisende Innenkappe, eine als Betätigungselement ausgebildete Außenkappe und eine zwischen Innenkappe und Außenkappe angeordnete Drehmoment-Übertragungseinrichtung aufweist, die nur unter Ausübung einer zusätzlichen Öffnungstätigkeit, beispielsweise Ausüben von axialem Druck, durch den Benutzer in Eingriff zu bringen und zu halten ist, während die Originalitäts-Sicherungseinrichtung einen durch axialen Zug abtrennbaren Abreißring aufweist, der unter einen Bund an dem die Behälteröffnung aufweisenden und den Behälterverschluß tragenden Behälterhals greift.

Ein solcher sowohl mit Originalitäts-Sicherungseinrichtung als auch mit nur durch Ausübung von axialem Druck auf die Schraubverschlußkappe, also mit Kindersicherung ausgestatteter Behälterverschluß ist aus DE-OS 33 00 347 bekannt. Ein besonderes Problem bei derartigen in doppelter Hinsicht gesicherten Behälterverschlüssen ist die geeignete Abstimmung der Originalitätssicherungseinrichtung auf die zwischen Innenkappe und Außenkappe der Schraubverschlußkappe angeordnete Drehmoment-Übertragungseinrichtung. Eine solche Abstimmung wird bei dem aus DE-OS 33 00 347 bekannten Behälterverschluß durch besondere Gestaltung der Drehmoment-Übertragungseinrichtung angestrebt. Jedoch bedingt eine solche besondere Gestaltung der Drehmoment-Übertragungseinrichtung präzise Ausbildung der zusammenwirkenden Teile und verursacht dadurch eine erhebliche Erhöhung der Herstellungskosten für derartige Behälterverschlüsse. Ferner besteht bei dem aus DE-OS 33 00 347 bekannten Behälterverschluß die Möglichkeit, daß durch die dort vorgesehene direkte Anbringung eines Abreißringes zur Originalitätssicherung über Verbindungsstege an der Innenkappe der Schraubverschlußkappe nicht nur axiales Abreißen des Abreißringes eintritt, sondern bereits ein Abtrennen durch relatives Verdrehen von Innenkappe und Originalitätssicherungsring. Diese letztere Möglichkeit macht aber die Originalitäts-Sicherungseinrichtung ansprechempfindlicher als es dem prakti-

schen Gebrauchszweck entspricht.

Demgegenüber ist es Aufgabe der Erfindung, einen verbesserten Sicherheits-Behälterverschluß zu schaffen, bei welchem ungewollte gegenseitige Beeinflussung von Originalitäts-Sicherungseinrichtung und Drehmoment-Übertragungseinrichtung erheblich vermindert ist und bei dem vor allem begrenztes Verdrehen der Innenkappe der Schraubverschlußkappe auf dem Gewinde des Behälterhalses noch nicht, sondern erst eine merkliche axiale Bewegung der Innenkappe der Schraubverschlußkappe das Ansprechen der Originalitäts-Sicherungseinrichtung hervorruft.

Diese Aufgabe wird erfindungsgemäß dadurch gelöst, daß der durch axialen Zug abtrennbare Abreißring der Originalitäts-Sicherungseinrichtung an einem von der Schraubverschlußkappe getrennten Originalitäts-Sicherungsring ausgebildet ist, der den Bund am Behälterhals umgibt und selbst vom freien Randbereich der Innenkappe umgeben ist, wobei der Originalitäts-Sicherungsring einen über auf axialen Zug ansprechende Abreißelemente an den Abreißring angeschlossenen Mitnahmering enthält, der über sich in Abschraubsinn der Schraubverschlußkappe lediglich axial verhakende Rasteinrichtungen in Kraftschluß-Verbindung mit der Innenkappe steht.

Durch die Erfindung wird erreicht, daß keine die Abreißelemente am Abreißring gefährdende Drehmomentübertragung auf den Originalitäts-Sicherungsring erfolgen kann. Durch die grundsätzliche Trennung des Originalitäts-Sicherungsringes von der Innenkappe der Schraubverschlußkappe läßt sich die Herstellung des erfindungsgemäßen Sicherheits-Behälterverschlusses wesentlich verbilligen. Dabei läßt sich durch Dimensionierung der Abreißelemente am Originalitäts-Sicherungsring und durch Dimensionierung der an der Innenkappe vorgesehenen Teile der Drehmoment-Übertragungseinrichtung eine sehr genaue und reproduzierbare Abstimmung von Drehmoment-Übertragungseinrichtung und Originalitäts-Sicherungseinrichtung auch bei Massenherstellung solcher Sicherheits-Behälterverschlüsse gewährleisten.

Es ist zwar aus FR-PS 22 90 364 ein Behälterverschluß bekannt, bei welchem ein von der Schraubverschlußkappe getrennter Originalitäts-Sicherungsring vorgesehen ist. Jedoch ist bei diesem bekannten Behälterverschluß eine einfache Schraubverschlußkappe ohne innere Drehmoment-Übertragungseinrichtung vorgesehen, so daß dort auch nicht an eine Abstimmung von Originalitätssicherungseinrichtung und Drehmoment-Übertragungseinrichtung gedacht ist. Außerdem ist die Kraftschluß-Verbindung zwischen der Schraubverschlußkappe und dem Originalitäts-Sicherungsring bei diesem bekannten Behälterverschluß derart ausgebildet, daß beim Abschrauben der Schraubverschlußkappe vom Behälterhals zunächst ein Festklemmen des in der Schraubverschlußkappe gehaltenen Teiles des Originalitäts-Sicherungsringes am Bund des Behälterhalses erfolgt. Dies bedingt aber eine so beträchtliche Erhöhung des aufzubringenden Drehmoments, wie es mit der beim erfindungsgemäßen Sicherheits-Behälterverschluß vorgesehenen Drehmoment-Übertragungseinrichtung nicht mit ausreichender Sicherheit erfolgen kann.

In bevorzugter Ausführungsform der Erfindung ist die in axialer Richtung wirksame Kraftschlußverbindung zwischen Innenkappe und Originalitäts-Sicherungsring dadurch geschaffen, daß die Innenkappe an der Innenfläche ihres Randbereiches einen Rastring mit

nach dem Kappenrand zu flach verlaufendem, dreieckigem Querschnitt und der Mitnahmering eine im wesentlichen in einer Normalebene zur Verschlußachse liegende, auf den Abreißring zu gerichtete Rastschulter aufweisen. Diese Ausbildung der Kraftschlußverbindung zwischen Innenkappe und Originalitätssicherungsring bietet einerseits volle Funktionssicherheit d.h. sicheres Abreißen des Abreißringes an den Abreißelementen beim ersten Öffnen. Andererseits läßt sich durch diese Ausbildung der Kraftschlußverbindung beim Zusammensetzen des erfindungsgemäßen Sicherheits-Behälterverschlusses der Originalitäts-Sicherungsring in einfacher Weise und ohne Beschädigungsgefahr in den Randbereich der Innenkappe einführen.

Besonders vorteilhaft ist es dabei, wenn die Innenfläche der Innenkappe innerhalb des Rastringes zu passendem Sitz des von der Innenkappe aufgenommenen Mitnahmeringes ausgebildet ist. Auf diese Weise kann der Mitnahmering nach dem Abreißen des Abreißringes, also nach dem ersten Öffnen des Verschlusses, die Funktion eines Führungsringes an der Umfangsfläche des Bundes am Behälterhals übernehmen. Außerdem ergibt sich durch dieses Zusammenpassen eine definierte Lage des Originalitäts-Sicherungsringes in und an der Innenkappe.

Erfindungsgemäß kann der Abreißring mit einer axial auf die Innenkappe zu gerichteten Aufsetzschulter für den Stirnrand der Innenkappe ausgebildet sein. Hierdurch wird eine zweite definierte Abstützung des Originalitäts-Sicherungsringes an der Innenkappe geschaffen, durch die beim erstmaligen Verschließen des Behälterverschlusses einfach auf den Behälterhals geschraubt werden, ohne Beschädigungsgefahr an dem Originalitäts-Sicherungsring und dessen Abreißelementen. Dabei ist es von besonderem Vorteil, den Rastring mit einer auf das Innere der Innenkappe zu gerichteten steilen Abschrägung zum axialen Einziehen des Originalitäts-Sicherungsringes in die Innenkappe unter fester Anlage an die innerhalb des Rastringes gebildeten Innenflächenteile der Innenkappe und feste Anlage der Aufsetzschulter an den Stirnrand der Innenkappe auszubilden. Dadurch bildet der aus Außenkappe, Innenkappe und Originalitäts-Sicherungsring zusammengesetzte erfindungsgemäße Sicherheits-Behälterverschluß bereits vor dem Aufbringen auf den Behälterhals eine stabile Einheit, die sich als solche auch sicher transportieren läßt. Dies gilt insbesondere dann, wenn die Außenkappe mit einem zumindest den Randbereich der Innenkappe ggf. auch noch den Abreißring umgebenden Schutzkragen ausgebildet ist.

Der Abreißring kann im Rahmen der Erfindung bevorzugt durch einen sich ringsum erstreckenden, nur von einer Anzahl von ringsum verteilten Verbindungs- und Abreißstegen überbrückten Schlitz vom Mitnahmering getrennt sein. Hierdurch ist eine sehr empfindliche Verbindung zwischen Mitnahmering und Abreißring geschaffen, die selektiv auf axialen Zug anspricht. Dies wird ermöglicht durch die praktisch keine Drehmomente übertragende Kraftschlußverbindung zwischen dem Originalitäts-Sicherungsring und der Innenkappe ermöglicht. Die Verbindungs- und Abreißstege können dabei als an der Innenfläche des Originalitäts-Sicherungsringes vorstehende Rippen ausgebildet sein. Diese Ausbildung läßt einfache, billige Herstellungsweise des Originalitäts-Sicherungsringes zu, ermöglicht genaue reproduzierbare Abstimmungsdimensionierung und bietet den zusätzlichen Vorteil, daß solche rippenförmig-

gen Abreißstege zugleich ein Verklemmen des Originalitäts-Sicherungsringes am Bund des Behälterhalses vermeiden, aber andererseits nach dem erstmaligen Öffnen gute Führungsfunktion für die Schraubverschlußkappe am Bund des Behälterhalses bieten.

In vorteilhafter Ausführung der Erfindung kann der Abreißring in seinem Inneren mit einem unter den Bund des Behälterhalses greifenden Haltekragen mit widerhakenartigem Querschnitt ausgebildet sein. Hierdurch erübrigt sich das nachträgliche Umbördeln des Abreißringes um den Rand des Bundes am Behälterhals, wodurch auch die bei solchem Umbördeln auftretende Beschädigungsgefahr an den Abreißelementen entfällt.

Ein Ausführungsbeispiel der Erfindung wird im folgenden anhand der Zeichnung näher erläutert. Es zeigen:

**Fig. 1** einen erfindungsgemäßen Sicherheits-Behälterverschluß in axialem Schnitt mit gestrichelt angedeutetem Behälterhals und

**Fig. 2** den Bereich 2 der **Fig. 1** in vergrößerter Darstellung.

Bei dem in der Zeichnung dargestellten Beispiel weist der Sicherheits-Behälterverschluß 10 eine Schraubverschlußkappe 11 mit einer Außenkappe 12 und einer Innenkappe 13 sowie einen Originalitäts-Sicherungsring 24 auf. Die Außenkappe 12 ist aus mittelhart eingestelltem Kunststoff hergestellt und stellt so ein bequemes, aber stabiles Handhabungselement dar, während die Innenkappe 13 aus hart eingestelltem Kunststoff besteht, wobei an ihr die Dichtungselemente 14 direkt ausgebildet sein können. Der Originalitäts-Sicherungsring 24 besteht aus weichem Kunststoff, beispielsweise Polyolefin wie PE.

Zwischen der Außenkappe 12 und der Innenkappe 13 ist eine Drehmoment-Übertragungseinrichtung gebildet, die an der inneren Stirnseite der Außenkappe 12 ausgebildete radiale Rippen 15 und an der äußeren Stirnseite der Innenkappe 13 ausgebildete radiale Rippen 16 aufweist. Diese Rippenanordnung ist derart, daß durch axiales Zusammendrücken von Außenkappe 12 und Innenkappe 13 die Rippen 15 und 16 ineinandergreifen. Normalerweise werden jedoch die Außenkappe 12 und die Innenkappe 13 durch einen an der inneren Stirnseite der Außenkappe 12 mittig ausgebildeten Federring 17 und an der äußeren Stirnseite der Innenkappe 13 mittig ausgebildeten Führungskonus 18 in gegenseitigem Abstand gehalten. Ferner enthält die Drehmoment-Übertragungseinrichtung an der inneren Umfangsfläche der Außenkappe 12 ausgebildete Ratschenleisten 19 und an der äußeren Umfangsfläche der Innenkappe 13 ausgebildete nach außen vorstehende Ratschenleisten 20. Die Außenkappe 12 ist außerdem im Bereich ihrer Ratschenleisten 19 mit einem federnden Wandbereich 21 ausgebildet. Bevorzugt sind drei Ratschenleistenpaare mit je 120° Winkelabstand auf dem Umfang der Schraubverschlußkappe 11 verteilt. Diese Ratschenleistenpaare sind so ausgebildet, daß sie bei Drehbewegung in Aufschraubsinn ineinandergreifen, so daß die Schraubverschlußkappe 11 ohne axiales Zusammendrücken von Außenkappe 12 und Innenkappe 13 auf den Behälterhals 22 in Schließstellung aufgeschraubt werden kann, während bei Drehen der Außenkappe im Öffnungssinn die Ratschenleisten 19 und 20 aneinander vorbeigleiten und eine nennenswerte Drehmomentübertragung nur bei Ineinandergreifen der radialen Rippen 15 und 16, also bei axialem Zusammendrücken von Außenkappe 12 und Innenkappe 13 erfolgt. Da die Innenkappe 13 die Gewindeteile 23 enthält, ist

somit ein Abschrauben der Schraubverschlußkappe 11 vom Behälterhals 22 nur unter axialem Zusammendrücken von Außenkappe 12 und Innenkappe 13 möglich.

Wie die Zeichnung zeigt, ist in die Innenkappe 13 ein Originalitäts-Sicherungsring 24 eingesetzt, der einen mit Kraftschlußverbindung im Inneren des Randbereiches 25 der Innenkappe 13 gehaltenen Mitnahmering 26 und einen aus der Innenkappe 13 axial herausragenden Abreißring 27 aufweist. Der Abreißring 27 ist durch einen ringsumlaufenden Schlitz 28 von dem Mitnahmering 26 getrennt. Jedoch erstrecken sich an der Innenfläche des Mitnahmeringes 26 und des Abreißringes 27 axial gerichtete rippenförmige Abreißelemente 29, die sich gegen die äußere Umfangsfläche des an dem Behälterhals gebildeten Bundes 30 legen. Der Abreißring 27 weist einen Haltekragen 31 mit widerhakenartigem Querschnitt auf, der sich unter den Bund 30 des Behälterhalses 22 legt und dadurch ein axiales Abziehen des Abreißringes 27 vom Behälterhals 22 verhindert.

Die Kraftschlußverbindung zwischen dem Randbereich 25 der Innenkappe 13 und dem Mitnahmering 26 ist durch einen im Randbereich 25 an der Innenseite der Innenkappe 13 ausgebildeten sich ringsum erstreckenden Rastring 32 und eine am Mitnahmering 26 ausgebildete sich ringsum erstreckende und nach dem Abreißring 27 hin gerichtete Rastschulter 33 gebildet. Der Rastring 32 hat einen dreieckigen Querschnitt mit einer nach der Öffnungsseite der Innenkappe liegenden, flach geneigten Flanke 34 und einer nach dem Inneren der Innenkappe 13 liegenden steilen Flanke 35. Die Rastschulter 33 des Mitnahmeringes 26 liegt in einer Normalebene zur Verschlußachse.

Von dem Rastring 32 an einwärts der Innenkappe 13 sind zwei ringförmige Flächenbereiche 36 und 37 gebildet, die an dem Mitnahmering 26 gebildeten ringförmigen Außenflächenbereichen angepaßt sind, so daß ein genauer Sitz zwischen den Außenflächenbereichen des Mitnahmeringes und den Innenflächenbereichen 36 und 37 in der Innenkappe 13 gegeben ist.

Der Abreißring 27 weist eine sich ringsum erstreckende Aufsetzschulter 38 auf, auf die sich der Stirnrand 39 der Innenkappe 13 setzt. Durch die steile Flanke 35 des Rastringes 32 und die in einer Normalebene zur Verschlußachse liegende Rastschulter 33 steht der in den Randbereich 25 der Innenkappe 13 eingesetzte Originalitätssicherungsring 24 einer nach dem Inneren der Innenkappe 13 gerichteten Zugkraft, die den Mitnahmering 26 ständig in Anlage an den ringförmigen Innenflächenteilen 36 und 37 hält und auch die Anlageschulter 38 ständig in Anlage an den Stirnrand 39 der Innenkappe zieht. Da der Originalitäts-Sicherungsring 24 auf diese Weise sicher im Randbereich 25 der Innenkappe 13 gehalten ist, kann er aus weichem Kunststoff, beispielsweise Polyolefin, bestehen.

Zum verbesserten Schutz des Randbereiches 25 der Innenkappe 13 kann die Außenkappe 12 mit einem diesen Randbereich 25 umgebenden Schutzkragen 40 ausgebildet sein. Dieser Schutzkragen kann im Unterschied zum dargestellten Beispiel auch noch über den Abreißring 27 erstreckt sein.

Die drei Teile des Sicherheitsbehälterverschlusses, nämlich die Außenkappe 12, die Innenkappe 13 und der Originalitäts-Sicherungsring sind getrennt herzustellen und durch axiales Ineinandersetzen durch Verrasten miteinander zu vereinigen. Beim erstmaligen Verschließen eines Behälters mit dem so gebildeten Sicherheitsbehälterverschluß gleitet der widerhakenartig ausgebildete Haltekragen 31 über den Bund 30 am Behälterhals,

bis er unter den Bund 30 rastet. Dabei legen sich die rippenförmigen Abreißelemente 29 an die Umfangsfläche des Bundes 30.

Dadurch wird im Bereich des Mitnahmeringes 26 ein wesentlich größerer Reibungs-Kraftschluß zwischen dem Bund 30 und dem Originalitäts-Sicherungsring geschaffen als im Bereich des Haltekragens 31. Bei geringem Verdrehen der Innenkappe gegenüber dem Behälterhals 22 werden daher keine nennenswerten Drehmomente über die Abreißelemente 29 auf den Abreißring 27, sondern eher direkt auf die Umfangsfläche des Bundes 30 übertragen. Die Größe der von der Innenkappe 13 auf den Originalitäts-Sicherungsring 24 übertragenen Drehmomente wird ohnehin durch die zwischen den ringförmigen Flächenteilen 36 und 37 und der Umfangsfläche des Mitnahmeringes 26 herrschende nur geringe Reibung begrenzt. Andererseits ergibt sich jedoch durch die Reibung der rippenförmigen Verbindungs- und Abreißelementen 29 an der Umfangsfläche des Bundes 30 und die Reibung an den Flächenteilen 36, 37 eine Abbremsung an der Innenkappe 13, die ausreicht, merkliches Verdrehen der Innenkappe zu verhindern, wenn die Ratschenleisten 19 und 20 übereinander hinweggleiten.

Beim ersten Öffnen wird durch den von der Innenkappe 13 am Gewinde 23 entwickelten und über den Rastring 32 und die Rastschulter 33 auf den Mitnahmering 26 ausgeübte axiale Zug benutzt, um die rippenförmigen Verbindungs- und Abreißelemente 29 im Bereich des Schlitzes 28 abzureißen, so daß der Abreißring 27 hinter dem Bund 30 gefangen bleibt und anzeigt, daß der Behälter einmal geöffnet worden ist. Im übrigen bilden die rippenförmigen Verbindungs- und Abreißelemente 29 durch ihre Berührung mit der Umfangsfläche des Bundes 30, sei es bei ihrer gleitenden Bewegung in Umfangsrichtung des Bundes oder in Axialrichtung, eine sichere axiale Führung für die gesamte Schraubverschlußkappe und eine zusätzliche Sicherung dafür, daß die in der Schraubverschlußkappe 11 vorgesehene Drehmomentübertragungseinrichtung im Öffnungssinne des Verschlusses nur durch Zusammengreifen der radialen Rippen 15 und 16, also durch axiales Zusammendrücken von Außenkappe 12 und Innenkappe 13 wirksam wird, nicht aber durch irgendwelches Greifen an den Ratschenleisten 19 und 20.

- 30 Bund
- 31 Haltekragen
- 32 Rastring
- 33 Rastschulter
- 34 Flanke geneigt
- 35 Flanke steil
- 36 Flächenbereich
- 37 Flächenbereich
- 38 Aufsetz
- 39 Stirnrand
- 40 Schutzkragen

#### Bezugszeichenliste

- |                                  |    |
|----------------------------------|----|
| 10 Sicherheits-Behälterverschluß |    |
| 11 Schraubverschlußkappe         | 50 |
| 12 Außenkappe                    |    |
| 13 Innenkappe                    |    |
| 14 Dichtungselement              |    |
| 15 radiale Rippen                |    |
| 16 radiale Rippen                | 55 |
| 17 Federring                     |    |
| 18 Führungskonus                 |    |
| 19 Ratschenleisten               |    |
| 20 Ratschenleisten               |    |
| 21 Wandbereich                   | 60 |
| 22 Behälterhals                  |    |
| 23 Gewindeteile                  |    |
| 24 Originalitäts-Sicherungsring  |    |
| 25 Randbereich                   |    |
| 26 Mitnahmering                  | 65 |
| 27 Abreißring                    |    |
| 28 Schlitz                       |    |
| 29 Abreißelement                 |    |

- Leerseite -

Fig. 1

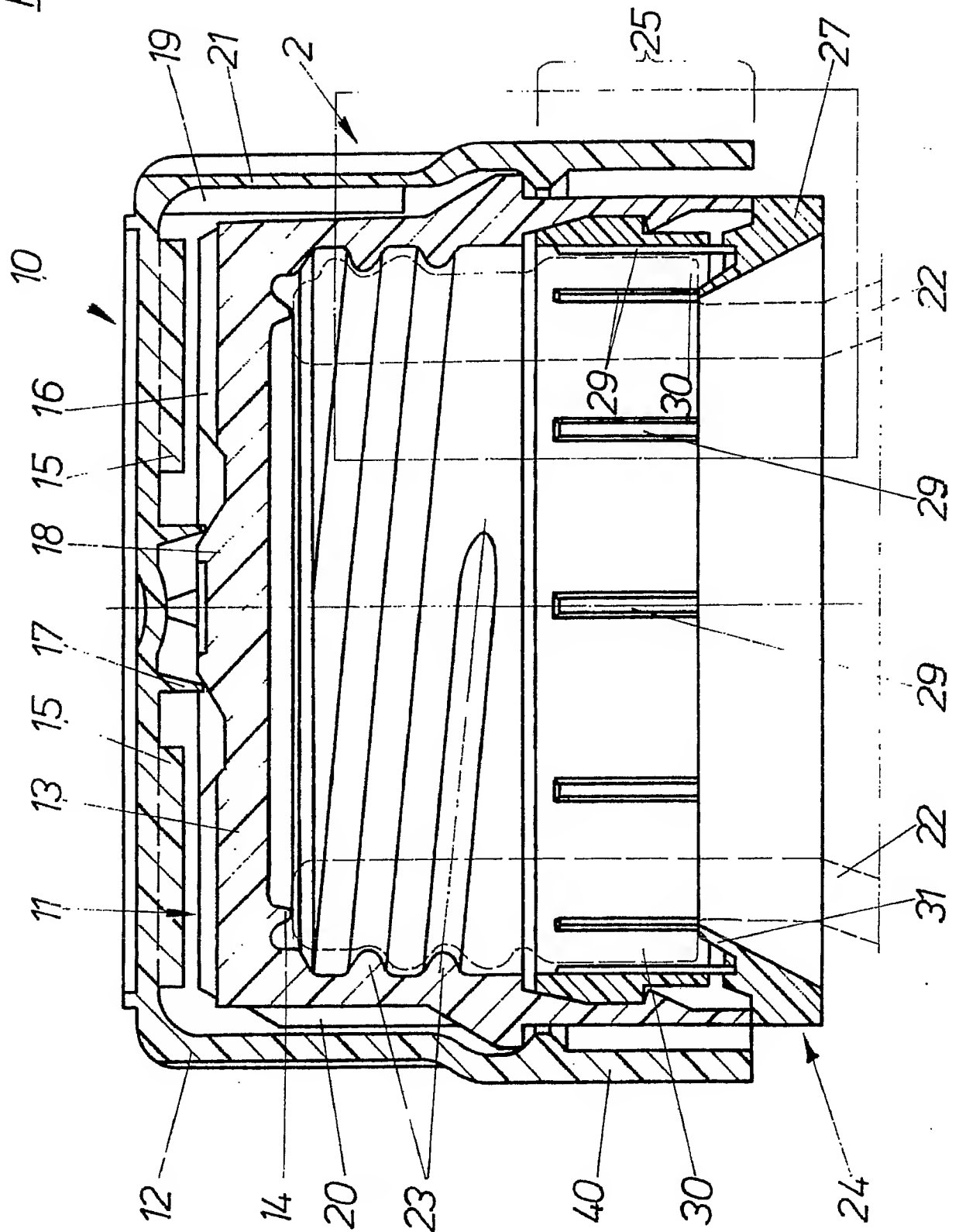
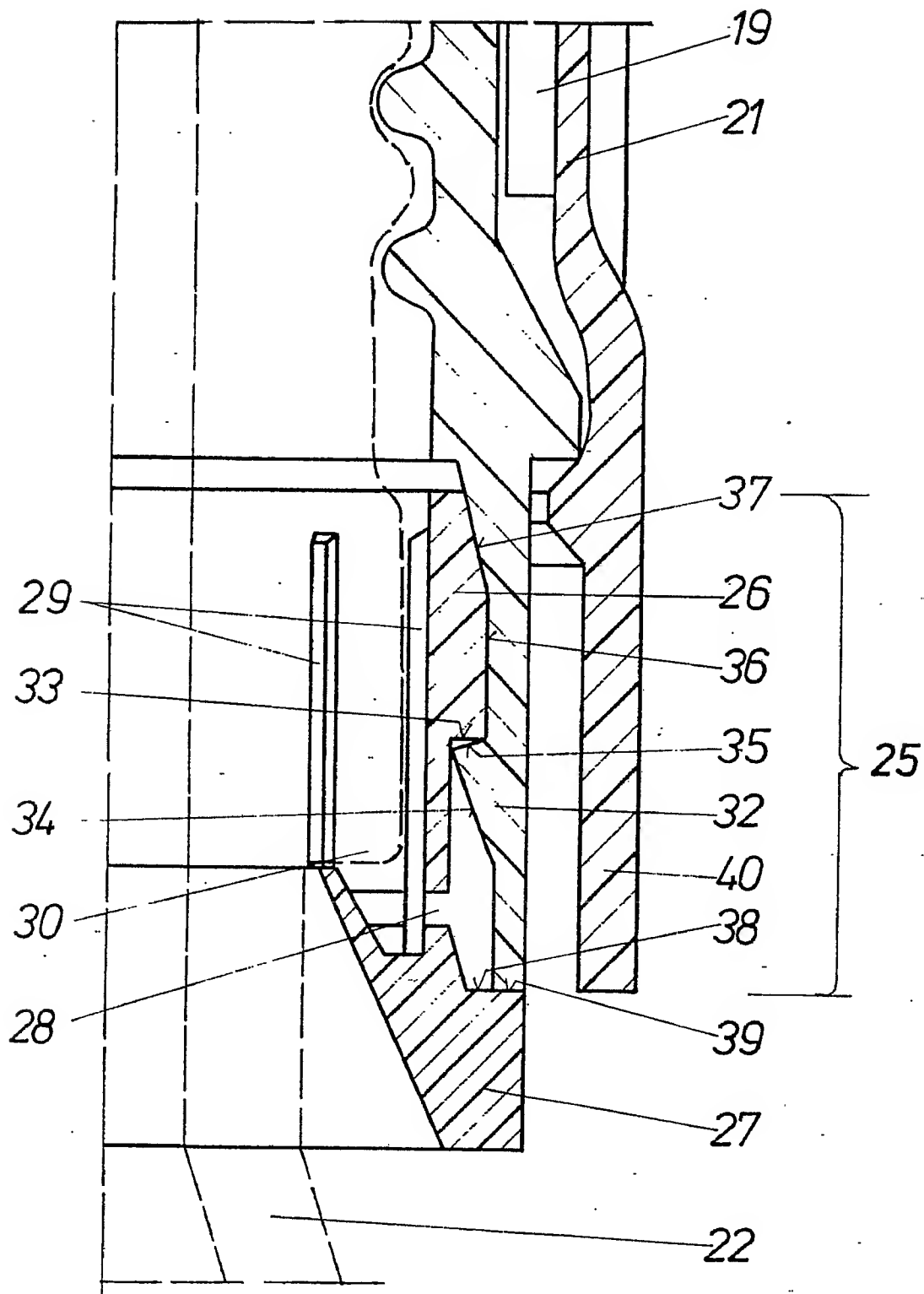


Fig. 2



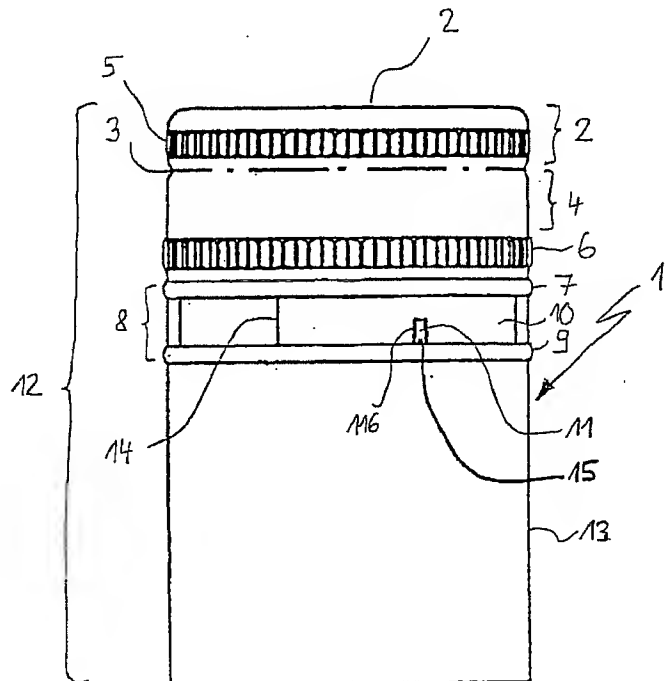
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⑭	Bekanntmachung im Patentblatt:	10. 5. 2001

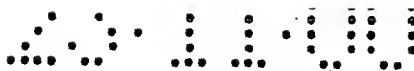
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See EP 1 335 863 B1

⑰ **Verschlusskappe**

- ⑱ Verschlusskappe (1) zum Verschließen einer Flasche oder eines anderen Behälters
- mit einem auf der Innenseite bevorzugt eine Dichtung aufweisenden Deckel (2),
  - mit einem sich vom Deckel (2) nahtlos nach unten erstreckenden, hülsenförmigen Schaft (12),
  - mit einem im Bereich des Schaftes (12) angeordneten Anrollbereich (4) zum Anrollen eines Gewindes,
  - mit einer an den Anrollbereich (4) anschließenden Verformungszone (10), in der ein Originalitätssicherungselement (11) angeordnet ist, das beim ersten Öffnen der Flasche oder des Behälters eine sichtbare Verformung erfährt, dadurch gekennzeichnet, dass das Originalitätssicherungselement von wenigstens einer Materialschwächung (11) im Bereich der Verformungszone (10) gebildet wird, die ausgehend von einer unteren ungeschwächten Basislinie (15) eine nach oben weisende geschlossene Kontur (111, 112, 113, 114, 115, 116, 117) bildet.





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5

### **Verschlußkappe**

- 10 Die Erfindung betrifft eine Verschlußkappe gemäß dem Oberbegriff des Schutzanspruchs 1.

Eine derartige Verschlußkappe ist aus der DE 43 38 004 C2 bekannt. Bei dieser bekannten Verschlußkappe ist der Originalitätssprengring durch eine  
15 Verformungszone im Bereich des Schaftes gebildet, die nach oben durch eine Reihe von horizontalen Schlitten mit dazwischen liegenden Stegen und nach unten durch eine nach außen vorspringende Sicke begrenzt wird. Zusätzlich sind im Bereich der Verformungszone vertikale Materialschwächungen vorgesehen. Beim erstmaligen Öffnen der Flasche weitet sich die  
20 Verformungszone beim Abschrauben auf den Außendurchmesser des Flaschengewindes auf, so dass die Kappe insgesamt einstückig entfernt werden kann. Die vertikalen Materialschwächungen weiten sich dabei mehr oder weniger regelmäßig auf und bilden somit einen Indikator für die Erstöffnung der Flasche. Hierbei ist die Abstimmung so getroffen, dass die für  
25 die Aufweitung erforderliche Kraft kleiner ist als die zum Abreißen der Stege zwischen den horizontalen Schlitten erforderliche Kraft. Nachteilig bei dieser bekannten Verschlußkappe ist, dass die Einbringung der Schlitten und Stege sowie die Abstimmung der Abreißkräfte für die Stege bzw. die Aufweitungskräfte für die Materialschwächungen einen erhöhten Aufwand  
30 erfordert. Außerdem können, wie in DE 43 38 004 C2 beschrieben, beim erstmaligen Öffnen der Flasche die vertikalen Materialschwächungen bis in den Bereich der horizontalen Schlitten aufreißen. Damit entstehen scharfkantige





Sektionen in diesem Bereich des Verschlusses, die wiederum zu Verletzungen der Finger des Benutzers führen können. Zudem ist es nachteilig, dass sich der Verschluss beim Wiederverschließen mit einfachen Mittel manipulieren lässt, indem beispielsweise mit einem runden Gegenstand, wie einem Nagel, nach dem Aufschrauben der Verschlusskappe im Bereich des Originalitätssprenglings die ursprüngliche Einrollung durch Andrücken dieses Gegenstandes wieder erzeugt werden kann. Der Verbraucher kann dann nicht mehr eindeutig erkennen, ob bereits vorher eine Erstöffnung erfolgte. Einem Austausch, einer Vermischung oder schlimmstenfalls sogar einer Vergiftung des Flascheninhaltes ist damit Tor und Tür geöffnet.

Der vorliegenden Erfindung liegt die Aufgabe zugrunde, eine Verschlusskappe zu schaffen, die ein einteiliges Abschrauben in Verbindung mit einem dichten Wiederverschließen und einer eindeutigen Originalitäts-Sicherung ermöglicht.

15

Diese Aufgabe wird durch die in Patentanspruch 1 angegebenen Mittel gelöst. Vorteilhafte Ausgestaltungen der Erfindung sind den Unteransprüchen zu entnehmen.

Die Erfindung sieht vor, dass das Originalitätssicherungselement von wenigstens einer Materialschwächung im Bereich der Verformungszone gebildet wird, die ausgehend von einer unteren ungeschwächten Basislinie eine nach oben weisende geschlossene Kontur bildet. Der von dieser Kontur umschlossene Materialbereich wird beim erstmaligen Abdrehen der Verschlusskappe vom Flaschenmundstück beim Aufweiten der Verformungszone aus dieser teilweise herausgetrennt und nach innen geklappt, so dass im Material bleibende, irreparable Fehlstellen entstehen, die dem Benutzer eindeutig anzeigen, ob die Flasche original verschlossen ist oder ob diese bereits geöffnet war. Dadurch, dass die Bereiche innerhalb der Konturen nach innen bewegt werden, entsteht auch keinerlei Verletzungsgefahr für den Benutzer der Verschlusskappe.





Besonders vorteilhaft ist die Erfindung an einer Verschlusskappe einsetzbar, bei der sich an die Verformungszone nach unten ein weiterer Schaftbereich anschließt. Derartige Verschlusskappen sind der Fachwelt auch unter den Begriffen Stelcap oder auch Longcap bekannt.

5

Bevorzugt wird die Verformungszone von einer oberen Sicke und einer unteren Sicke begrenzt. Derartige Sicken sorgen für eine eindeutige Begrenzung der Verformungszone und verleihen dem Verschluss mehr Stabilität im Schaftbereich.

10

Besonders bevorzugt ist eine Ausführungsform, bei der sich die Kontur der Materialschwächung im unteren Bereich der Verformungszone erstreckt. Dabei befindet sich der oberste Punkt der Kontur der Materialschwächung etwa in der Mitte der Verformungszone, bevorzugt etwas unterhalb der Mitte der Verformungszone. Durch diese Maßnahme wird erreicht, dass sich das Material im Bereich der Kontur der Verformungszone bei der Erstöffnung eindeutig nach innen in den Innenbereich der Verschlusskappe bewegt, so dass keine Vorsprünge nach außen gebildet werden, die eine Verletzungsgefahr für die Finger des Benutzers darstellen könnten.

20

Bevorzugt sind in der Verformungszone am Umfang verteilt mehrere weitere im wesentlichen vertikal verlaufende Materialschwächungen vorgesehen, wie diese an sich aus dem eingangs zitierten Stand der Technik bekannt sind. Diese Materialschwächungen erleichtern das Aufweiten der Verformungszone bei der Erstöffnung der Flasche.

25

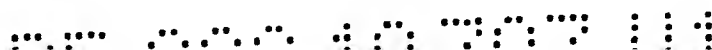
Bevorzugt sind am Umfang verteilt mehrere als Originalsicherungselemente dienende Materialschwächungen angeordnet. Hierdurch ist unabhängig von der Betrachtungsrichtung der Verschlusskappe eindeutig feststellbar, ob die Flasche noch original verschlossen ist oder ob diese bereits geöffnet war.

30





- Im Gegensatz zum eingangs gewürdigten Stand der Technik weist der Schaft bevorzugt keine horizontal verlaufende Schlitz mit dazwischen liegenden Stegen auf. Hierdurch ist eindeutig gesichert, dass sich nicht der obere Teil der Verschlusskappe vom unteren Teil abtrennt, was das Entfernen des unteren
- 5 Teils von der Flasche und somit das getrennte Recyclieren von Metall und Glas erschweren würde. Die erfindungsgemäße Verschlusskappe lässt sich ohne Zuhilfenahme von Werkzeugen vollständig unter Aufweitung der Verformungszone beim ersten Öffnen von der Flasche abschrauben. Sie lässt sich zum Wiederverschließen mehrfach wieder dicht auf die Flasche
- 10 aufschrauben und ist schließlich beim Recyclieren vollständig von der Flasche entfernbar. Somit wird die Altglasschmelze freigehalten von unnötig hohen Aluminiumanteilen. Die einteilige Entfernbarkeit des Verschlusses ermöglicht außerdem dessen Verwendung auch bei Flaschen des Mehrwegsystems.
- 15 Zum Erleichtern des Öffnen und Schließens ist vorgesehen, dass die Verschlusskappe im Bereich des Seitenrandes des Deckels und/oder unterhalb des Anrollbereiches wenigstens einen Rändel aufweist. Durch einen solchen Rändel wird in an sich bekannter Weise die Griffbarkeit erhöht, wobei zwei voneinander beabstandete Rändel hierbei besonders bevorzugt sind.
- 20 Die für das Originalitätssicherungselement dienende Materialschwächung weist bevorzugt ausgehend von der ungeschwächten Basis, die bevorzugt unmittelbar an die untere Sicke heranreicht, eine Kontur in Gestalt einer regelmäßigen geometrischen Figur auf, wie beispielsweise der eines Dreiecks,
- 25 eines Rechtecks, eines Trapez, eines Halbkreises, einer Halb-Ellipse oder dergleichen. Eine derartige regelmäßige geometrische Figur ist an einem entsprechenden Rollierwerkzeug in einfacher Weise herstellbar.
- Die Verwendung einer bestimmten Kontur oder einer bestimmten Abfolge
- 30 mehrerer wechselnder Konturen kann dabei auch als Codierung für den Flascheninhalt dienen. Ähnlich wie bei einem Barcode können dabei



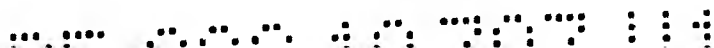


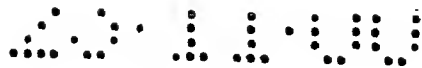
Eigenschaften, Abfüllzeitpunkt, Haltbarkeit, Abfüllort oder ähnliches in codierter Weise an der Verschlusskappe als Information hinterlegt werden.

5 Eine erfindungsgemäße Verschlusskappe wird bevorzugt zum Verschließen einer Weinflasche verwendet. Nachdem dies bereits bei Weinflaschen des unteren Preissegments mit kurzen Verschlusskappen üblich ist, ist eine erfindungsgemäße Verschlusskappe auch in hervorragender Weise aufgrund ihrer ausgezeichneten Dicht- und Handhabungseigenschaften zum Verschließen von Weinflaschen des mittleren oder oberen Preissegments  
10 geeignet. Die Außenflächen des Schaftes können dabei als Werbeflächen bedruckt werden.

Eine andere bevorzugte Verwendung sieht vor, dass eine derartige Verschlusskappe zum Verschließen einer Spirituosen enthaltenden Flasche  
15 dient.

Wenn vorstehend im Zusammenhang mit der Anwendung eines erfindungsgemäßen Verschlusses von einer Flasche als zu verschließendem Behälter gesprochen wird, so ist für den Fachmann klar, dass anstelle einer  
20 Flasche auch jeder andere Behälter, der mit einem Schraubverschluß versehen ist, Verwendung finden könnte und insoweit auch vom Schutz der Ansprüche umfaßt sein soll. Dies gilt beispielsweise für Behälter, Kanister, Gebinde, Blister, Tüten oder sonstige Verpackungen aus Metall, Glas, Kunststoff, Pappe oder anderen Materialien bzw. Verbundmaterialien. In diesen können außer den  
25 bereits erwähnten alkoholischen Getränken, wie Wein oder Spirituosen auch nichtalkoholische Getränke, flüssige oder nicht flüssige Lebensmittel, wie Essig, Öl, Salz, Zucker, Mehl oder dergleichen oder auch Stoffe aus dem Bereich der Chemie oder der Medizin beherbergt sein. Für alle Anwendungsfälle ist es vorteilhaft, dass jederzeit erkennbar ist, ob eine noch nicht angebrochene  
30 Originalverpackung vorliegt. Weiterhin ist für alle Anwendungsfälle vorteilhaft, dass das durch einen erfindungsgemäßen Verschuß verschlossene Gut sowohl vor dem ersten Öffnen des jeweiligen Behälters als auch nach jedem





Wiederverschließen geruchs-, geschmacks- und feuchtigkeitsgeschützt verschlossen ist, so dass weder der Inhalt durch äußere Einflüsse beeinträchtigt wird, noch die Umgebung durch den Inhalt.

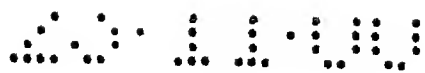
- 5 Der verwendete Begriff „Verschlußkappe“ ist auch nicht im engeren Sinn als eine rein metallische Verschlußkappe zu verstehen, auch wenn diese bevorzugt aus Aluminium oder einer Aluminiumlegierung hergestellt wird. Selbstverständlich könnten auch Bleche, Kunststoffe oder Folien aus Verbundmaterialien zur Herstellung einer Verschlußkappe Verwendung finden, deren Material eine plastische Verformung ermöglicht und ein Herausbrechen bzw. -klappen der Originalitätssicherungselemente bei der Erstöffnung gewährleistet.

- 15 Wenn in Zusammenhang mit den Originalitätssicherungselementen von Materialschwächungen mit einer geschlossenen Kontur gesprochen wird, ist für den Fachmann klar, dass auch Konturen mit geringfügigen ungeschwächten Unterbrechungen ein äquivalentes Ergebnis erzeugen können, wenn das Material an den Unterbrechungen insgesamt so schwach ist, dass es dem Herausklappen der Originalitätssicherungselemente keinen entscheidenden Widerstand entgegensetzt und bei der Erstöffnung durchtrennt wird.

Nachfolgend ist ein Ausführungsbeispiel der Erfindung anhand der Zeichnung beschrieben. Es zeigt:

- 25 Fig. 1: eine Seitenansicht einer Verschlußkappe,
- Fig. 2: einen etwas vergrößerten Teilbereich mit der Verformungszone und mehreren Varianten einer Kontur einer Materialschwächung als Originalitätssicherungselement und
- 30 Fig. 3: einen Teilquerschnitt gemäß der Linie III. – III. zur Verdeutlichung der Tiefe der Materialschwächung.

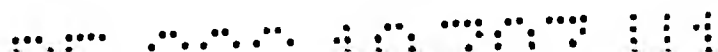




Eine Verschlusskappe 1 setzt sich aus einem Deckel 2 und einem insgesamt mit 12 bezeichneten Schaft zusammen. Sie wird in bekannter Weise aus einer Roh tafel aus Aluminium bzw. einer Aluminium legierung von einer Dicke  $d_1$  von  
5 etwa 0,21 mm bis 0,24 mm hergestellt. Derartige Tafeln werden zunächst bedruckt und/oder lackiert und - falls erforderlich - in Streifen geschnitten. Durch Stanzen kreisrunder Ausschnitte mit anschließendem Tiefziehen werden die Rohkappen hergestellt, auf die anschließend durch Rollieren Sicken, Rändel, Materialschwächungen oder dergleichen angeformt werden. Dabei  
10 dient eine den Deckel 2 nach unten begrenzende, nach innen vorspringende Sicke 3 bevorzugt zur Befestigung eines nicht dargestellten Dichtungselements, das auf der Innenseite des Deckels 2 entweder als eingelegte Dichtscheibe, als Ventileinsatz oder als Kunststoffschäum (PVC-Compound oder PVC-freie Dichtungsmasse) ausgebildet ist. Die Dichtungselemente können auf der der  
15 Flaschenmündung zugewandten Seite Dichtungslippen, -rippen oder ähnliches aufweisen.

An die Sicke 3 schließt sich nach unten ein Anrollbereich 4 an, in welchem später beim Anwender (im Normalfall beim Hersteller oder Abfüller) nach  
20 Aufsetzen der Verschlusskappe das Gewinde an dieser auf der Flasche angerollt wird. Zur Erhöhung der Griffigkeit beim Öffnen und Wiederverschließen ist im Bereich des Deckels 2 am Außenrand ein erster oberer Rändel 5 vorgesehen. Dieser wird bevorzugt durch einen zweiten unteren Rändel 6 ergänzt, der sich nach unten an den Anrollbereich 4 für das  
25 Gewinde anschließt.

Unterhalb des unteren Rändels 6 ist eine nach außen vorspringende Sicke 7 angeformt, welche eine Bördelzone 8 begrenzt. Die Bördelzone 8 wird nach unten von einer weiteren nach außen vorspringenden Sicke 9 begrenzt. Der  
30 zwischen den Sicken 7 und 9 liegende Bereich der Bördelzone 8 ist als Verformungszone 10 ausgebildet, welche beim Anwender durch ein





Anrollwerkzeug unter das sich an das Gewinde anschließende Bördelband am Flaschenhals nach innen verformt und angerollt wird.

In der Verformungszone 10 sind zum einen vertikale Materialschwächungen 14 vorgesehen, von denen bevorzugt mehrere gleichmäßig am Umfang verteilt sind und zum anderen wenigstens eine Materialschwächung 11, die als Originalitätssicherungselement verwendet wird. Vorzugsweise sind ebenfalls mehrere als Originalitätssicherungselemente dienende Materialschwächungen 11 am Umfang der Verformungszone 10 verteilt und zu den vertikalen Materialschwächungen 14 versetzt angeordnet.

Die Materialschwächungen 14 dienen der Erleichterung der Sickenbildung in diesem Bereich beim Anrollen und auch der Erleichterung des Aufweitens der Verformungszone 10 beim erstmaligen Öffnen der Flasche. Bei einem solchen erstmaligen Öffnen der Flasche reißen die beschriebenen Materialschwächungen 11 an ihren jeweiligen Konturen auf, das Originalitätssicherungselement löst sich bis auf die geschlossene untere Basislinie 15 aus der Verformungszone 10 heraus und wird beim Abdrehen des Verschlusses 1 vom Mundstück der Flasche über die Basislinie 15 auf die Innenseite des Schaftes abgeklappt. Es entstehen dadurch den Konturen dieser Materialschwächungen 11 entsprechende Fenster in der Verschlußkappe 1.

Wie der Fig. 1 zu entnehmen ist, erstrecken sich die als Originalitätssicherungselemente verwendeten Materialschwächungen 11 ausgehend von ihrer unteren geschlossenen, ungeschwächten Basislinie 15, die an die untere Sicke 9 angrenzt über maximal die untere Hälfte der Verformungszone 10 in einer geschlossenen Kontur nach oben. Dabei ist nur diese geschlossene Kontur als Einkerbung in das Material eingebracht. Als Konturformen eignen sich bevorzugt regelmäßige geometrische Figuren, von denen eine begrenzte Auswahl beispielhaft in Fig. 2 dargestellt ist. Dort finden sich Materialschwächungen mit einer halbkreisförmigen Kontur 111, einer





dreieckigen Kontur 112, der bereits aus Fig. 1 bekannten rechteckigen Kontur 116, einer schild- oder blattförmigen Kontur 114, einer Tonnengewölbförmigen Kontur 113, einer quadratischen Kontur 115 und einer trapezförmigen Kontur 117. Diese Konturen sind, wie Fig. 3 verdeutlicht, als Einkerbungen in  
5 das Material der Verschlusskappe 1 derart eingeformt, dass von der ursprünglichen Dicke  $d_1$  von etwa 0,21 mm bis 0,24 mm eine Dicke  $d_2$  erhalten bleibt, die etwa 0,10 mm oder weniger beträgt. Durch die Anordnung im unteren Bereich der Verformungszone 10 ist sichergestellt, dass beim Abdrehen des Verschlusses vom Mundstück der Flasche die von den Konturen 111 bis 117  
10 umgebenen Materialbereiche nach innen klappen, so dass keine nach außen vorragenden Metallteile eine Verletzungsgefahr darstellen. Die Materialschwächungen 11 erzeugen beim erstmaligen Öffnen ausgebrochene Fenster im Verformungsbereich 10, die nicht wieder verschließbar sind und somit eindeutig und irreversibel eine Öffnung der Flasche signalisieren.

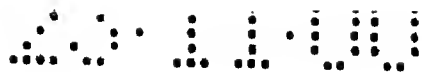
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An die untere Sicke 9 schließt sich bevorzugt ein unterer Schaftbereich 13 an, der insbesondere beim Verschließen von Weinflaschen oder Spirituosenflaschen bedruckt verwendet wird. Zum Bedrucken dieses Bereiches wird bevorzugt eine Seitenbedruckungsmaschine verwendet.

20

Die erfindungsgemäße Verschlusskappe ist aufgrund ihrer hervorragenden Handhabungseigenschaften beim erstmaligen Öffnen und beim Wiederverschließen sowie aufgrund ihres fälschungssicheren Originalitätssicherungselements auch zum Verschließen von Flaschen mit  
25 hochwertigen Getränken geeignet. Hierfür bieten sich sowohl Spirituosen als auch Weine des mittleren und oberen Preissegments an. Eine metallische Verschlusskappe weist dabei gegenüber einem Kork eindeutige Vorteile bezüglich eines prozeßsicheren dichten Verschließens und des ebenso dichten Wiederverschließens auf, wobei nach dem Wiederverschluß aufgrund der  
30 hervorragenden Dichteigenschaften auch eine liegende Lagerung möglich ist.



**Bezugszeichenliste**

	1	Verschußkappe
5	2	Deckel (Bereich für Aufnahme einer Dichtung)
	3	Sicke
	4	Anrollbereich (für Gewinde)
	5	(oberer) Rändel
	6	(unterer) Rändel
10	7	Sicke
	8	Bördelzone (Verformungszone mit Originalitätssicherungselement)
	9	Sicke
	10	Verformungszone
	11	Materialschwächung als Originalitätssicherungselement
15	12	Schaft
	13	unterer Schaftbereich
	14	(vertikale) Materialschwächungen
	15	Basislinie (von 11)
	111	Kontur der Materialschwächung 11 (Halbkreis-förmig)
20	112	Kontur der Materialschwächung 11 (dreieckig)
	113	Kontur der Materialschwächung 11 (Tonnengewölbe-förmig)
	114	Kontur der Materialschwächung 11 (Schild- oder blattförmig)
	115	Kontur der Materialschwächung 11 (quadratisch)
	116	Kontur der Materialschwächung 11 (rechteckig)
25	117	Kontur der Materialschwächung 11 (trapezförmig)



### Schutzansprüche

5

1. Verschußkappe (1) zum Verschließen einer Flasche oder eines anderen Behälters

10

- mit einem auf der Innenseite bevorzugt eine Dichtung aufweisenden Deckel (2),

- mit einem sich vom Deckel (2) nahtlos nach unten erstreckenden, hülsenförmigen Schaft (12),

- mit einem im Bereich des Schaftes (12) angeordneten Anrollbereich (4) zum Anrollen eines Gewindes,

15

- mit einer an den Anrollbereich (4) anschließenden Verformungszone (10), in der ein Originalitätssicherungselement (11) angeordnet ist, das beim ersten Öffnen der Flasche oder des Behälters eine sichtbare Verformung erfährt,

20

**dadurch gekennzeichnet, dass** das Originalitätssicherungselement von wenigstens einer Materialschwächung (11) im Bereich der Verformungszone (10) gebildet wird, die ausgehend von einer unteren ungeschwächten Basislinie (15) eine nach oben weisende geschlossene Kontur (111, 112, 113, 114, 115, 116, 117) bildet.

25

2. Verschußkappe nach Anspruch 1, dadurch gekennzeichnet, dass sich an die Verformungszone (10) nach unten ein weiterer Schaftbereich (13) anschließt.

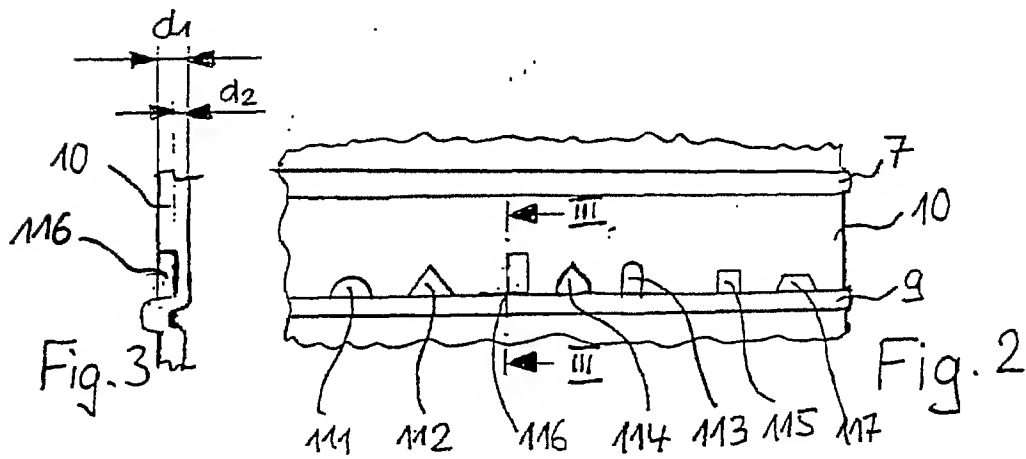
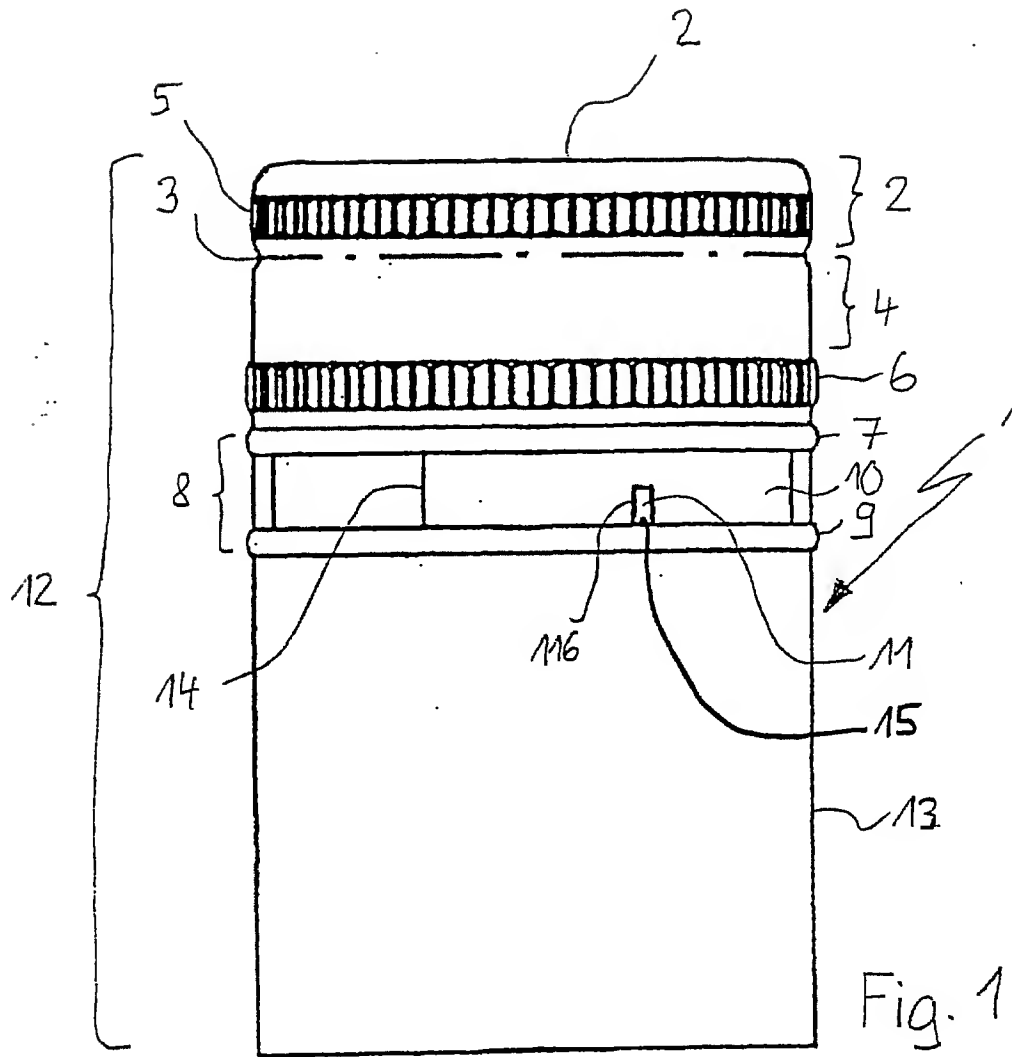
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3. Verschußkappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Verformungszone (10) von einer oberen Sicke (7) und einer unteren Sicke (9) begrenzt wird.

4. Verschlusskappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass sich die Kontur (111, 112, 113, 114, 115, 116, 117) der Materialschwächung (11) im unteren Bereich der Verformungszone (10) erstreckt.
5. Verschlusskappe nach Anspruch 4, dadurch gekennzeichnet, dass sich der oberste Punkt der Kontur (111, 112, 113, 114, 115, 116, 117) der Materialschwächung (11) etwa in der Mitte der Verformungszone (10) befindet.
6. Verschlusskappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass in der Verformungszone (10) am Umfang verteilt mehrere weitere im wesentlichen vertikal verlaufende Materialschwächungen (14) vorgesehen sind.
7. Verschlusskappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass am Umfang verteilt mehrere als Originalitätssicherungselement dienende Materialschwächungen (11) angeordnet sind.
8. Verschlusskappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass der Schaft (12) keinerlei horizontal verlaufende Schlitze mit dazwischen liegenden Stegen aufweist.
9. Verschlusskappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass diese aus Aluminium bzw. einer Aluminium-Legierung besteht.
10. Verschlusskappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass diese im Bereich des Seitenrandes des Deckels (2)

und/oder unterhalb des Anrollbereiches (4) wenigstens einen Rändel (5, 6) aufweist.

- 5 11. Verschußkappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die als Originalitätssicherungselement dienende(n) Materialschwächung(en) (11) in Verbindung mit der ungeschwächten Basislinie (15) eine regelmäßige geometrische Figur, wie die Kontur (112) eines Dreiecks, die Kontur (116) eines Rechtecks, die Kontur (117) eines Trapez, die Kontur (111) eines Halbkreises, einer Halb-Ellipse oder  
10 dergleichen bildet.
12. Verschußkappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass das verbleibende Material im Bereich der Materialschwächungen (11) eine Stärke d2 aufweist, die etwa die Hälfte  
15 der Dicke d1 des Ausgangsmaterials oder weniger als die Hälfte derselben beträgt.
13. Verschußkappe nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass eine Verwendung einer Kontur (111, 112, 113, 114, 115, 116, 117) oder eine bestimmte Abfolge mehrerer wechselnder  
20 Konturen (111, 112, 113, 114, 115, 116, 117) als Codierung für den Flascheninhalt (Eigenschaften, Abfüllzeitpunkt, Abfüllort, Haltbarkeit oder dergleichen) dient.



12

# **EUROPEAN PATENT APPLICATION**

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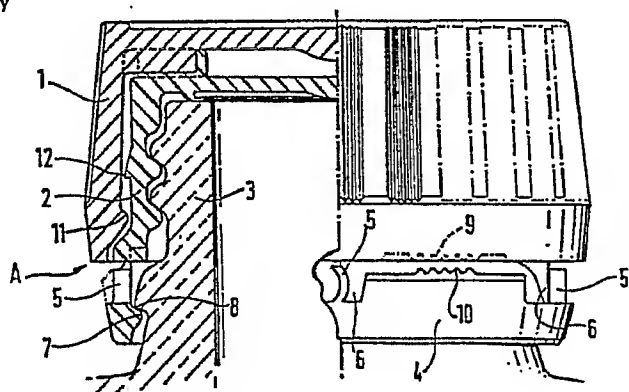
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54 **Tamper-resistant press-and-turn closure.**

57 This invention comprises a Turn-Lok closure (1, 2) with a child-resistant press and turn feature within which the closure is also provided with tamper-resistant means (4) including a safety band connected to the Turn-Lok part of the closure by frangible means (5).

**FIG.1.**



This invention is concerned with the provision of a child-resistant and tamper-resistant closure for a container.

5 Zeller Plastik in their British Patent No. 1529999 have described a very effective child resistant closure which works on a press and turn principle. That closure can be screwed on to the neck of a container to close the mouth but it cannot be unscrewed without at the same time applying top pressure to the closure. The Zeller Plastic closure is  
10 now known on the market as a "Turn Lok" closure and this invention incorporates the features of the "Turn Lok" closure as described in Patent No. 1529999 as the child-resistant feature.

In more detail Patent No. 1529999 provides a child-resistant press and turn or Turn Lok closure for a  
15 container having an externally screw-threaded neck, the closure being made from plastics material and comprising a screw cap and overcap being relatively movable both axially and angularly, projections on one of said caps  
20 and co-operating projections or recesses on or in the other of said caps, said projections or recesses having first faces on one side thereof which co-operate to transmit rotational movement from the overcap to the screw cap when the overcap is rotated in a direction to screw the closure

25 onto the neck of a said container and unscrew the closure

opposite sides thereof, the second face of each projection or recess of one of said caps being a cam face whereby, in use, the overcap will rotate relative to the screw cap with said projections or recesses of the different caps camming  
5 past one another when the overcap is rotated in a direction to unscrew the closure from the neck of a said container unless the overcap is moved axially relative to the screw cap so that each said cam face is engaged by an edge of the second face of a projection or recess of the other cap with  
10 a force sufficient to overcome the cam action.

The Turn-Lok closure is very efficient as a child-resistant closure but it is not tamper-resistant and recent events in USA have shown that it is desirable to sell certain products e.g. food, medicaments, toilet  
15 preparations and so on in containers with tamper-resistant closures so that purchasers can see whether the container has been opened. However, once opened legitimately by the purchaser, it is essential with products hazardous to children that the package remains  
20 child-resistant. It is therefore an object of the present invention to provide a Turn-Lok closure with a tamper-resistant feature.

-3-

According to the present invention there is provided a Turn-Lok closure with a child-resistant press and turn feature characterised in that the closure is also provided with tamper-resistant means including a  
5 safety band connected to the Turn-Lok part of the closure by frangible means.

In one embodiment when the closure is in position the safety band may be held down by engagement with an annular projection on an associated container so that  
10 when the closure is removed the frangible means, which connect the band to the skirt of the screw cap of the Turn-Lok part of the closure, are broken. In another similar embodiment the safety band is connected by the frangible means to the skirt of the overcap. In each  
15 embodiment the upper edge of the safety band is provided with serrations or fine teeth for co-operation with serrations or fine teeth on the skirt to which the safety band is connected.

Each of the two embodiments may be assembled and  
20 applied to the container in one screwing-on operation.

-4-

In order that the invention may be more clearly understood reference is now directed to the accompanying drawings given by way of example in which:-

5        Figure 1 is a sectional side elevation of a first embodiment of the invention, and

Figure 2 is a sectional side elevation of a second embodiment of the invention,

Referring first to Figure 1, the closure may  
10 conveniently be divided into two parts, firstly a child-resistant part disposed above the arrow A and secondly a tamper-resistant part disposed below the arrow A.

The child-resistant part is a standard Turn-Lok  
15 closure as described in UK Patent No. 1529999 and comprises an overcap 1 and a screw cap 2, the screw cap 2 can move axially within the overcap 1 and when once in position on the neck of a container 3 overcap 1 can be turned freely in relation to the screw cap 2 as

-5-

long as projections on the screw cap and the overcap are not caused to interlock by the application of axial pressure to the overcap. Full details of the construction and operation of the Turn-Lok closure are given in UK Patent No. 1529999 and so further description will not be given here.

To provide a tamper-evident feature for the closure the screw cap 2 has a tamper-evident band 4 connected to the bottom of the skirt of the screw cap 2 by frangible bridge members 5 disposed in gaps 6 in the band 4. The band 4 also has an internal annular bead 7 to engage below an external annular bead 8 on the neck of the container 3. The lower edge of the skirt of the screw cap 2 has serrations or fine teeth 9 to engage with serrations or fine teeth 10 on the upper edge of the band 4 when the closure is being screwed onto the container.

In operation the closure is applied to the mouth of the container and is screwed on in the usual way. The act of screwing the closure onto the container causes the

- 6 -

screw cap 2 to move slightly towards the band 4 due to pressure being applied to the closure and this causes the fine teeth or serrations 9 to engage positively with the fine teeth or serrations 10 on the band 4 so that the band 4 turns with the screw cap 2 and the bridge members 5 flex but do not break. At the end of the movement of the closure the bead 7 passes over the bead 8 and snaps into position below the bead 8 as shown in Figure 1. When the closure is to be unscrewed axial downward pressure is applied to the closure so that the projections or engaging dogs with matching recesses on the screw cap 2 with the overcap 1 begin to rise. However the band 4 resists turning, because the bead 7 has settled firmly below the bead 8. The frangible bridge members 5 therefore break as the closure is being removed.

It will therefore be understood that if a closure is in position with the bridge members 5 intact that gives evidence that the closure almost certainly has not previously been removed but if the bridge members 5 are broken the closure has probably been removed and the contents of the container may have been tampered with or contaminated.

In order to minimise the risk of a child removing the

which, in operative position, is disposed below an annular projection 12 on the screw cap in such a position that the overcap 1 can undergo limited upward and downward movement relatively to the screw cap 2, in the manner  
5 described in greater detail in UK Patent No. 1529999.

It will be noted that the bridge members 5 have a reduced or weakened portion at their point of connection to the skirt of the screw cap 2. An annular deformable sealing member is arranged for co-operation with the rim  
10 around the mouth of the container 3 as shown in the drawing.

The second embodiment of the invention differs from the first embodiment in that the tamper-evident band 4 is connected to the overcap 1 instead of to the screw cap 2.  
15 The same references are used in Figure 2 as in Figure 1, for the same parts. When the closure is applied to the container the fine teeth or serrations 9 engage with the fine teeth or serrations 10 and the band 4 turns with the screw cap 2 until the bead 7 is in the position shown  
20 in Figure 2, below the bead 8 on the container 3. Alternatively, the screw cap 2 can be first applied and the overcap 1 can be applied by top pressure only as a secondary sealing operation. When axial pressure is applied to the overcap 1 and the closure is turned to

-8-

unscrew it, the bead 7 engages with the bead 8 as the overcap 1 is moved upwardly and the band 4 is held down so that the frangible bridge members break as in the first embodiment.

5       The closure in both its embodiments is preferably made of a suitable resilient plastics material by a moulding operation and as shown we prefer to provide the overcap with vertical serrations. The container is preferably made of glass with a special neck  
10       profile, as shown, for co-operation with the closure, but can, of course, be made from any appropriate alternatives moulded in various plastic materials or fabricated in aluminium or sheet metal.

-1-

## CLAIMS:-

1. A Turn-Lok closure with a child-resistant press and turn feature characterised in that the closure is also provided with tamper-resistant means including a safety band connected to the Turn-Lok part of the  
5 closure by frangible means.
2. A closure, for closing the mouth of a container having a screw neck finish, wherein the closure has an inner part with an inner skirt adapted to engage with the screw neck of the container and, an outer part  
10 surrounding the inner part and including a depending outer skirt, a safety band connected either to the inner skirt or to the outers skirt by frangible means and adapted when in position to engage with the container to form anchor means and drive means on the  
15 inner and outer parts of the closure which are inter-enagageable with one another in use to allow the inner part to be unscrewed from the container only when the anchor means has been separated from the depending skirt and only by relative axial engagement  
20 between the outer and inner parts during unscrewing whereby the closure is child-resistant until separation of the anchor means and is still child-resistant

-2-

thereafter.

3. A closure, for closing the mouth of a container having a screw neck finish, wherein the closure has an inner part adapted to engage with the screw neck of the container, an outer part surrounding the inner part and including a depending skirt connected to a safety band in the form of anchor means by frangible means and drive means on the inner and outer parts of the closure which are interengageable with one another in use to allow the inner part to be unscrewed from the container only when the anchor means has been separated from the depending skirt and only by relative axial engagement between the outer and inner parts during unscrewing whereby the closure is child-resistant until separation of the anchor means and is still child-resistant thereafter.

4. A closure according to claim 1 wherein the safety band is held down against upward movement by engagement with an annular orojection on an associated container so that when the closure is removed the frangible means which connect the band to the skirt of the screw cap of the Turn-Lok part of the closure are broken.

-3-

5. A closure according to Claim 1 wherein the safety band is connected by the frangible means to the skirt of the overcap of the Turn-Lok part of the closure.
6. A closure according to Claim 1 wherein the upper  
5 edge of the safety band is provided with fine teeth for co-operation with fine teeth on the skirt to which the safety band is connected.
7. A closure according to Claim 1 wherein the screw  
10 cap of the Turn-Lok part of the closure has a tamper evident safety band connected to the bottom of the skirt of the screw cap by frangible bridge members disposed in gaps in the safety band.
8. A closure according to Claim 7 wherein the band has  
15 an internal annular bead to engage below an external annular bead on the neck of an associated container.
9. A closure according to Claim 7 wherein the overcap has an annular projection which, in operative position, is disposed below an annular projection on the screw cap.
10. A closure according to Claim 7 wherein the bridge  
20 members have a reduced portion at their point of connection to the skirt.
11. A closure according to Claim 1 wherein the overcap of the Turn-Lok part of the closure has a tamper evident

-4-

safety band connected to the bottom of the skirt  
of the overcap by frangible bridge members disposed  
in gaps in the safety band.

FIG.1.

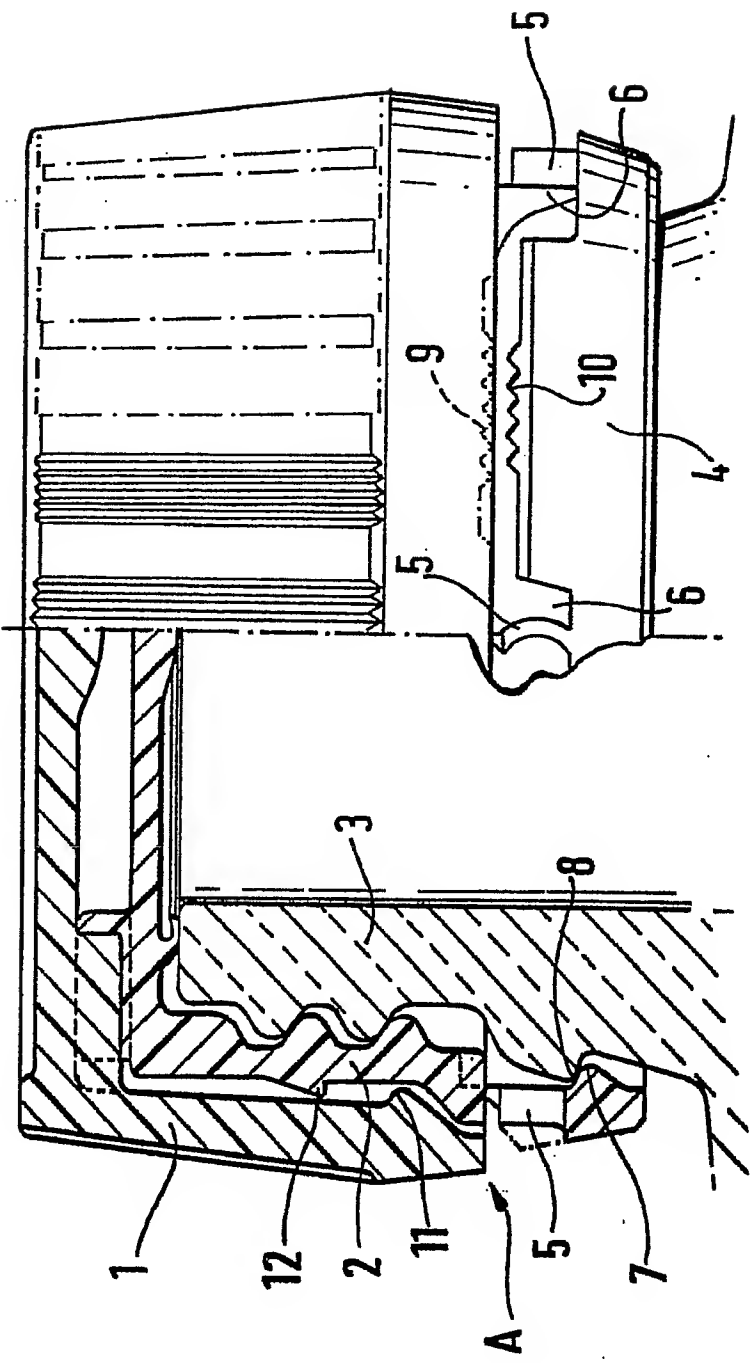
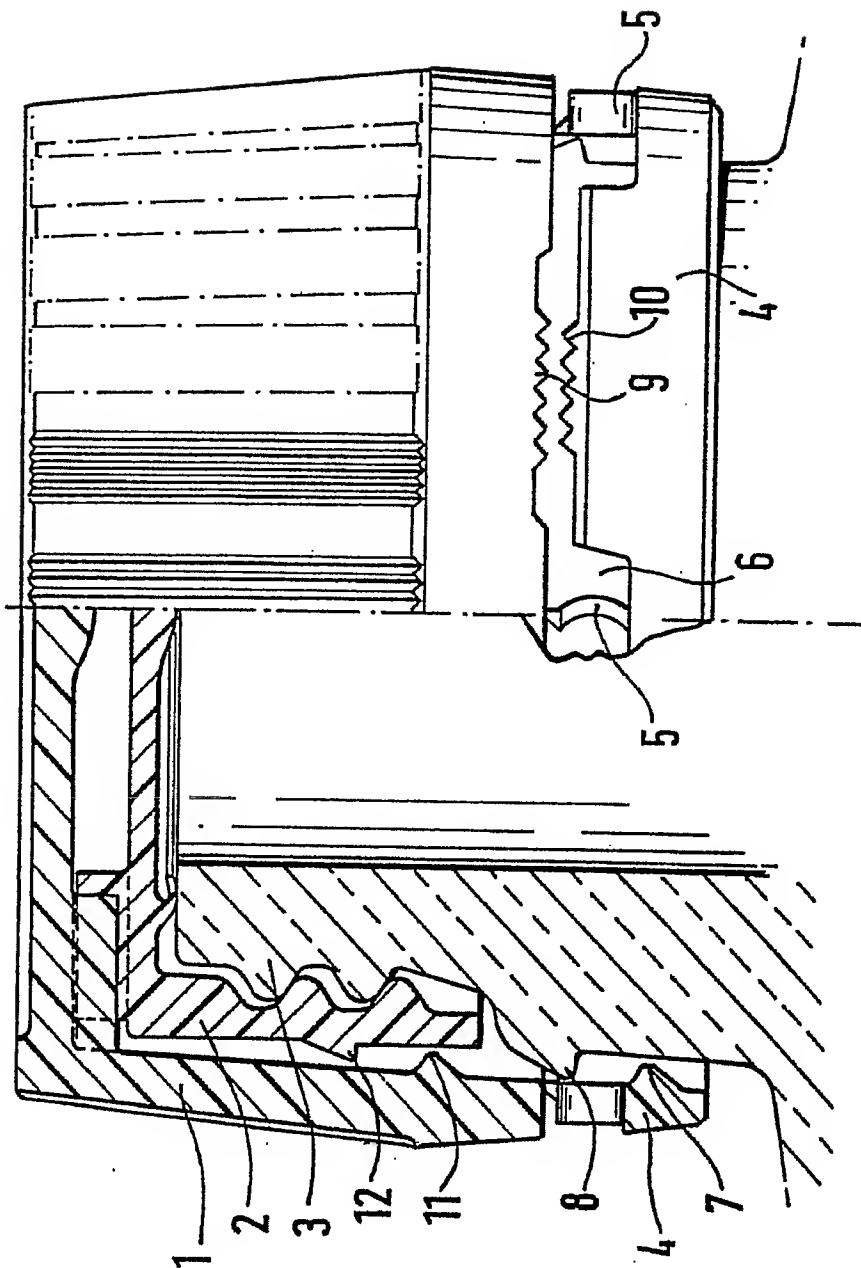


FIG. 2.





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	US-A-3 837 518 (GACH) *Column 2, line 57 - column 3, line 53; figures 1-5*	2,3	B 65 D 55/02 B 65 D 41/34
A		5,9	
Y,D	--- GB-A-1 529 999 (ZELLER PLASTIK) *Page 2, lines 45-119; figures 1-4*	1-11	
Y,P	--- EP-A-0 080 846 (JOHNSEN & JORGENSEN) *Page 3, line 7 - page 4, line 2; figures 1-3*	1-11	
	-----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 65 D
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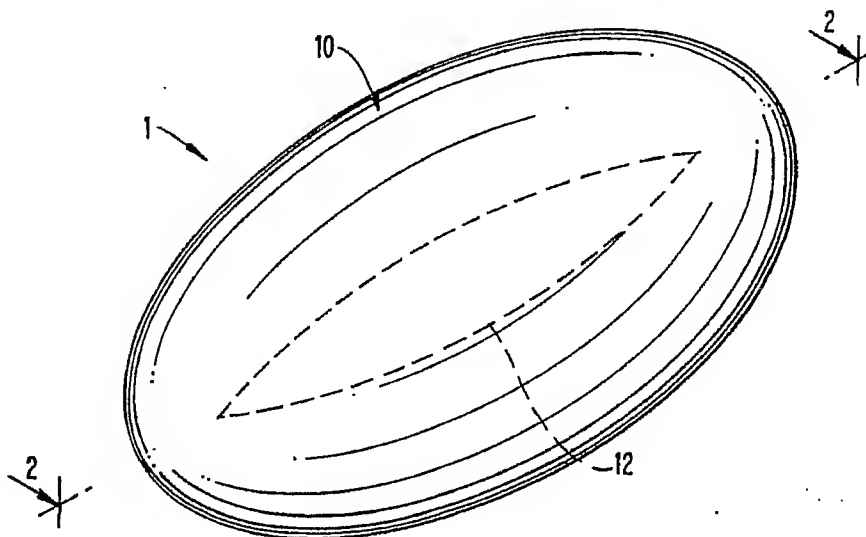
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<b>(21) International Application Number:</b> PCT/US93/06447 <b>(22) International Filing Date:</b> 12 July 1993 (12.07.93)  <b>(30) Priority data:</b> 07/954,714 30 September 1992 (30.09.92) US  <b>(60) Parent Application or Grant</b> <b>(63) Related by Continuation</b> US 07/954,714 (CON) Filed on 30 September 1992 (30.09.92)  <b>(71) Applicant (for all designated States except US):</b> PFIZER INC. [US/US]; 235 East 42nd Street, New York, NY 10017 (US).		<b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> LO, Julian, Belknap [US/US]; 20 Old Stagecoach Road, Old Lyme, CT 06371 (US).  <b>(74) Common Representatives:</b> RICHARDSON, Peter, C. et al.; Pfizer Inc., 235 East 42nd Street, New York, NY 10017 (US).  <b>(81) Designated States:</b> CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> With international search report.

**(54) Title:** ARTICLE CONTAINING A CORE AND A COATING HAVING A NON CONSTANT THICKNESS



**(57) Abstract**

An article for controlled release of medication from a dosage form wherein the article comprises a core containing said medication and a coating on the core having a non constant thickness.

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-1-

## 5 ARTICLE CONTAINING A CORE AND A COATING HAVING A NON CONSTANT THICKNESS

## BACKGROUND OF THE INVENTION

This invention relates to articles for the sustained release of pharmaceutical compositions contained therein. More particularly, it relates to articles comprising a core, containing said pharmaceuticals, at least partially coated with a coating of non-uniform thickness and processes for preparing such articles.

Controlled release of a medicine or drug is important for several reasons. In the first place it serves to provide the body with medication over a long time and thereby eliminates the need for ingesting standard dosage forms, e.g., tablets, comprising said medications, at frequent intervals. The treatment of any disease with a medicine requires a fairly constant high blood titre of the medicine. If the medicine is metabolized or otherwise eliminated quickly from the body it would be necessary to swallow an ordinary tablet quite often to maintain the desired blood level.

Some medicines have such a narrow therapeutic ratio that slightly more than is necessary, to achieve a therapeutic effect, will cause adverse toxic symptoms. If an ordinary tablet is taken, the rapid release of its medicament content may cause such a high blood level thereof that undesirable side reactions will occur.

Other medicines are irritating to the alimentary mucosa and their rapid release from ordinary dosage forms may cause damage to the alimentary organs. It is, therefore, desirable that dosage forms release such medications at a very low, preferably zero, initial rate and then at an exponentially increased rate upon reaching the stomach and/or intestine as required.

Dosage forms have been prepared in the past which will control the release of the contained medicine but they have not been entirely satisfactory. Some of them have been expensive to make either because of the expensive ingredients or the complicated apparatus or processes to make them or they have been too large to ingest because of the necessary additives to obtain the delayed release. Other tablets have been unsatisfactory because they have lacked a uniform release time although made in exactly the same way. U.S. Patents 3,538,214 and 4,060,598 refer to a tablet comprising a coating comprising a plastic material, insoluble in gastro-intestinal fluids, and a composition which is removable from the coating upon contact with either the stomach or intestinal fluids to form a dialytic membrane through which the medication slowly diffuses.

-2-

United States Patent 4,173,626 refers to a dosage form comprising a capsule containing a mixture comprising pellets of a medication which are uncoated and pellets of said medication coated with a slow dissolving material.

United States Patents 3,119,742 and 3,492,397 refer to dosage forms comprising  
5 a mixture of groups of coated pellets of a medicament wherein said coating comprises a slow dissolving material, with each group comprising a constant thickness of coating which differs from that of the other groups. Alternatively, the '742 patent indicates that each group may be coated with coating compositions of differing solubility rates.

The articles of the present invention employ inexpensive formulation materials  
10 and achieve controlled release of the medicine. These articles can be made of relatively small size. Furthermore, the total elapsed drug release time can be varied and established by the practice of this invention.

#### SUMMARY OF THE INVENTION

The present invention provides articles which overcome the above  
15 disadvantages. The articles may be so prepared that, by judicious choice of coating material, erosion of the coating in the alimentary canal may be limited to a small, if any, amount of erosion. The major portion of the medication will be released in the gastrointestinal tract and, depending on the choice of coating material, said release can be limited to the stomach or intestine.

20 In accordance with the invention, a core, e.g., a tablet, or capsule, containing the drug is made in a conventional manner and to at least a portion of it is applied an erodible coating composition, in a nonuniform thickness, which will slowly be removed from the surface of the core. This slow erosion action will occur because gastrointestinal fluids will slowly dissolve or disintegrate the coating to reach the drug in the  
25 core.

As the core is coated in a nonuniform manner the various portions of the surface of said core are contacted by said gastrointestinal fluids at different times. The core releases its pharmaceutical content at a rate which is proportional to the exposed surface area and concentration of medication in the core. As the erosion of the coating  
30 proceeds the exposed surface area of the core increases. During the same time, while the exposed core surface area has been increasing the concentration of the drug, in the core, has been decreasing. The overall effect of increasing exposed core surface area and decreasing drug concentration in the core is to maintain an approximately

-3-

constant rate of drug release from the core. In the case of a core exhibiting constant drug release, the increasing exposure of the core of the article causes the drug to be released at an increasing rate.

#### BRIEF DESCRIPTION OF THE DRAWINGS

- 5 Figure 1 is a perspective view of a first embodiment of the invention.  
Figure 2 is a front sectional view of the first embodiment along line 2-2 of Figure 1.  
Figure 3 is a side sectional view of the first embodiment along line 3-3 of Figure 1.  
Figure 4 is a front sectional view of a second embodiment of the invention.  
Figure 5 is a right side sectional view of the second embodiment along line 5-5 of  
10 Figure 4.  
Figure 6 is a left side sectional view of the second embodiment along line 6-6 of Figure 4.  
Figure 7 is a front sectional view of a third embodiment of the invention.  
Figure 8 is a right side sectional view of the third embodiment along line 8-8 of Figure  
15 7.  
Figure 9 is a top sectional view of the third embodiment along line 9-9 of Figure 8.  
Figure 10 is a front sectional view of a fourth embodiment of the invention.  
Figure 11 is a side sectional view of the fourth embodiment along line 11-11 of Figure  
20 10.

#### DETAILED DESCRIPTION OF THE INVENTION

20 The invention includes articles comprising coatings having shapes selected from spheroids, ellipsoids, cylinders and rectangular prisms in combination with cores having spheroidal, ellipsoidal, cylindrical or rectangular prismatic shapes with the proviso that if the coating and core are both spheroidal or both are cubic they are not concentric.

- 25 The invention may be best illustrated with reference to the figures.

A first embodiment of the invention, designated by the numeral 1, is illustrated in Figures 1-3.

- 30 As shown in Figure 2, the article comprises an ellipsoidal core 11, comprising a hollow cavity, containing the medication, surrounded by a wall 12 and an ellipsoidal coating 10. The core and coating comprise major axes b - b and a - a and minor axes b' - b' and a' - a', respectively. Other points on the surface of the core and coating are indicated by c and c', respectively.

-4-

After the device has been in contact with the eroding fluid for a period of time  $t_1$ , the coating will have eroded, uniformly, to points  $b_1$ ,  $c_1$ , and  $a_1$ . At a later time  $t_2$  the coating will have eroded completely along major axis  $b - b$  thereby exposing the points  $b'$  on the core and the surface of the core begins to dissolve thereby releasing the medication into the contacting fluid. Erosion of the coating will continue until, at a time  $t_3$ , the surface of the core between points  $b'$  and points  $c'$  will have become exposed thereby releasing additional medication into the eroding fluid. At that time a portion of the coating between  $c'$  and  $a_3$ , having a thickness  $a' - a_3$  will remain. During erosion of the coating, after the first release of medication, the exposed surface area of, and thereby the flux from, the core will increase. However, since the concentration of medication in the core will be decreasing, during that time, the release rate will be essentially constant until such a time when too little of the core wall remains and the balance of the medication is immediately released into the fluid.

As the coating erodes it takes the shape of an ellipsoid truncated at both ends. If the core wall comprises a composition soluble in the eroding fluid, the wall of the core will completely dissolve, after a time, and when said wall has dissolved and the area of the openings of the the truncated ellipsoidal core is sufficiently large the balance of contained medication will be released quickly in an uncontrolled manner.

If, however, the core wall is insoluble (e.g., an insoluble, osmotically permeable wall) or the core is a matrix tablet the structure of the core will maintain itself for a longer time, and, in the case of the osmotic tablet, it will not lose its form.

In Figures 1-3, the article illustrated is one wherein the thickness of the coating along the minor axis is less than, and continually increases to, that along the minor axis. It is to be understood that the reverse is also within the scope of the invention, i.e., where the thickness along the major axis is greater than along the minor axis. Furthermore, although the shape of the device along the minor axis, as shown in Figures 1-3, is circular it can also be ellipsoidal, rectangular, square, etc.

The composition of the coating will be chosen, as required, to be erodible by any one, or more, of the fluids in the esophagus, stomach and intestine.

If the coating is erodible by the esophageal fluids and it is desired that the contained medication not be released except in the stomach or intestine, the minimum coating thickness will be chosen so that sufficient coating remains on the core to prevent release of the medication until the article passes through the esophagus. The

-5-

article then passes into the stomach where the surface coating begins, or continues if erosion had commenced in the esophagus, to erode if the coating is sensitive to the acidic stomach fluids. If the coating is, instead, sensitive to the basic intestinal fluids the article will pass from the stomach into the intestine where erosion will continue or  
5 commence. In some cases, erosion of the coating with concomitant release of the medication will occur in the stomach and intestine.

Figures 4-6 illustrate a second embodiment of the invention, comprising a medication containing hollow cylindrical core 13 comprising a water insoluble, water permeable plastic wall 17, partially covered, at its end portions, by a cylindrical coating  
10 having non-uniform thicknesses. As shown in Figure 4, the central portion 16 of the wall 17 of the core 13 is uncoated. The left portion of the coating comprises a longitudinal section 14, adjacent the uncoated portion 16 of the core wall 17, and a transverse end section 20 of unequal thicknesses. The right portion of the coating comprises a transverse end section 21 and a longitudinal section 15 disposed between  
15 the uncoated section 16 of the core surface and said end sections.

In Figures 4-6 the thicknesses of all of the coating sections 14, 15, 20 and 21 are shown to be unequal. The thicknesses of the coating sections increase according to the order: is  $15 < 14 < 21 < 20$ . In the practice of the invention it is only necessary that two of the coating sections 14, 15, 20 and 21 be of unequal thickness.

20 After being placed in the eroding fluid the medication is first released through the uncoated portion 16 of the core wall 17. After a period of time, the coating section 15 will have eroded completely thereby exposing additional surface on the core. The resultant increased surface area of the exposed portion of the core will result in an increased drug release rate. After an additional period of time, the coating section 14  
25 will have completely eroded, the total exposed surface area will have again increased and the release rate of the medication will also have increased again. The above will continue until coating section 21 and then section 20 will have completely eroded. With proper choice of coating composition and thicknesses, core wall composition and medication concentration various combinations of release rate and time for complete  
30 release can be achieved.

A first aspect of a third embodiment of the invention comprising a circular cylindrical core 22 and a rectangular prismatic matrix coating 27 is illustrated in Figures 7-9. As shown in Figures 8-9 all six of the coating sections, i.e., sections 23, 24, 25,

26, 27 and 28, are of unequal thicknesses. This embodiment functions in the same manner as the first and second embodiments, i.e., as one section of coating is eroded the underlying portion of the core is exposed to the eroding fluid thereby permitting the medication to be released with concomitant reduction of the concentration of the medication in the tablet. As a result of the increasing exposed surface area and decreasing medication concentration in the core, the medication is released into the fluid at a sustained and approximately constant rate. Thus, by proper choice of coating composition, coating thicknesses, matrix binder composition and medication concentration in the tablet articles having differing drug release rates and times for total medication release may be prepared.

In a second aspect of the third embodiment, illustrated in Figures 10 and 11, the coating 29 comprises an ellipsoid and the core 30 a cylinder. This article functions in a similar manner to that of the first aspect of this embodiment.

The core can be of any type known in the art including soluble capsules, such as gelatin, porous capsules made of materials such as cellulose acetate and matrix tablets. The specific core type will be selected by the user in accordance with his requirements, e.g., compatibility with the medication.

The thickness and composition of the coating will be so chosen that erosion will occur, as required, in the esophagus, stomach or intestine or any combination thereof.

The coating composition comprises substances which are selectively, but readily soluble in, or disintegratable by, the stomach fluids or intestinal fluids. If it is intended that the medicament be released in the stomach, the coating composition must be one that will be removed by the acid fluids of the stomach. On the other hand, if it is intended that the medicament be released in the intestines (i.e. the article is to pass through the stomach substantially intact) the coating composition must be acid resistant and one that will be removed under the alkaline condition of the intestines.

For removal in the stomach, suitable coating compositions are polyvinyl pyrrolidone and solid polyethylene glycols, poly (ortho ester), poly ( $\epsilon$ -caprolactone), poly (acrylic acid), poly (vinyl alcohol), hydroxypropylmethyl cellulose, dextran, gelatin, polyacrylamide, polysaccharides, gum arabic, polyphosphates, Eudragit (trademark) E100 (a copolymer of dimethylaminoethyl methacrylate and methacrylic acid ester), a copolymer of glutamic acid and ethyl glutamate, polyglycolic acid, polylactic acid, a copolymer of lactide and  $\epsilon$ -caprolactone and a terpolymer of lactide, glycolide and

$\epsilon$ - caprolactone. For removal in the intestines, suitable coating compositions include cellulose acetate phthalate, hydroxypropylmethylcellulose acetate succinate, hydroxypropyl-methylcellulose phthalate and Eudragit (trademark) L 100 (a copolymer of methacrylic acid and methacrylic acid ester).

5           The desired rate of erosion may sometimes be achieved by a combination of materials from both groups.

          The coating composition is applied to the tablet or capsule core, the thickness being dependent upon the desired rate of release of the medication from the tablet. In practice, the range of thickness of the coating may be varied in accordance with the  
10       medicament employed and the amount of control of release desired by the practitioner hereof.

          To apply the coating composition, conventional tablet coating practices are used. They include use of a tumbling barrel, for the dose forms, into which the coating composition is sprayed or fluidized column techniques in which the coating  
15       composition is sprayed upwardly through the bed of dose forms.

          Heretofore, it has been the practice to apply an enteric type coating to pharmaceutical tablets to insure non-lesion inducing passage through the stomach. This enteric-type coating resists disintegration by stomach fluids but is fully disintegrated or dissolved by the intestinal fluids during its passage through the  
20       intestine. The present invention normally obviates the necessity for any such enteric-type coating. That is because the coating only dissolves slowly, if at all, in the stomach fluids and prevents or delays release of the medicinal agent in the stomach in accordance with the user's requirements. It allows slow release of the medicinal agent from the tablet into either the stomach or the intestines, depending on the user's  
25       needs.

          The coating of the invention not only restricts the access of the gastro-intestinal fluids to the medicinal agent of the matrix core, but it moreover serves to position or space the medicinal agent itself away from the gastro-intestinal mucosa so that a large concentration thereof is not permitted to reach a comparatively small area of the gastro-  
30       intestinal mucosa.

          In the practice of this invention, it is possible to provide a final overcoating to improve the appearance, taste or stability of the tablet. They may contain sugar, or a film former in combination with dyes or pigments, or even other medicaments. This

-8-

latter medicament may, for example, be one which is to be administered with the drug in the tablet core but which should not be in contact with each other in the complete tablet. This may be because of the incompatibility of the two or because it is desired that the medicine in the outer coating be released rapidly and that the drug in the core be released slowly.

The following examples are illustrative of the present invention and are not to be construed as limiting.

#### EXAMPLE 1

##### SOFT GELATIN CAPSULE WITH A NON-UNIFORM ERODIBLE COATING

Soft gelatin capsules (#6 oblong) of Procardia® (10 mg nifedipine) were coated with hydroxypropylmethylcellulose acetate succinate in a Hi-Coater (trademark). The coating level was thinner at the two ends of the capsule as illustrated in Figure 1. The coated and uncoated capsules were placed in a USP dissolution apparatus containing simulated intestinal fluid (U.S.P. XXII test solution adjusted to pH 7.0) at 37°C and stirred at 50 rpm. Aliquots of the test fluid were removed, from the apparatus, periodically and assayed for released medication at 225 nm in a UV spectrophotometer.

The in vitro release of nifedipine at pH 7.0 was monitored at 225 nm using a UV spectrophotometer. The erosion of the capsules in water started at the ends of the capsule where the coating was thinner. The in vitro release profile as shown in Figure 5 was fairly linear over 6 hours. For uncoated Procardia® capsules, nifedipine was released at pH 7.0 in 2 hours.

As shown in Table I the coated capsules released the medication at an approximately constant rate over a period of about six hours. On the other hand, more than half of the contained medication was released from the uncoated capsules within the first hour and the balance within the second hour.

-9-

TABLE I

	TIME (HOURS)	% NIFEDIPINE RELEASED FROM UNCOATED CAPSULE	% NIFEDIPINE RELEASED FROM COATED CAPSULE
5	0	0.0	0.0
	0.5	4.6	4.6
	1.0	61	1.0
	2.0	100	17.8
	4.0	100	50.8
10	6.0	100	100
	8.0	100	100

EXAMPLE 215      OSMOTIC CAPSULE WITH A NON-UNIFORM ERODIBLE COATING

Pseudoephedrine HCl (210 mg) was placed in a capsule made of a porous cellulose acetate membrane. The capsule was coated with 10 mg Eudragit (trademark) L100 at one end and 20 mg at the other, leaving the center of the capsule uncoated. This is illustrated in Figure 2.

20      The coated and uncoated capsules were placed in a USP dissolution apparatus containing simulated gastric fluid (U.S.P. XXII test solution, without enzyme, adjusted to pH 2.0) at 37°C and stirred at 50 rpm. Aliquots of the test fluid were removed, from the apparatus, periodically and assayed for released medication by HPLC using a Nova - Pak (trademark) C 18 column at a 254 nm detection wavelength.

25      Table II shows that very little of the medication was released by the coated capsules during the first three hours after exposure to the simulated gastric fluid. About one fourth of the medication was released during the next hour after which the medication was released at a sustained rate whereby only about 80% of the contained medication was released after a total exposure time of about fifteen hours. On the other  
30      hand, the uncoated capsules rapidly released their contained medication with about a third of the medication being released in the first two hours after exposure to the test fluid. The uncoated capsules then released the balance of their contained medication at a sustained rate which was greater than that for the coated capsules. As a

-10-

consequence, most of the medication had been released from the uncoated capsules in about ten hours.

TABLE II

TIME (HOURS)	% PSEUDOEPHEDRINE HCl RELEASED FROM UNCOATED OSMOTIC CAPSULE	% PSEUDOEPHEDRINE HCl RELEASED FROM COATED OSMOTIC CAPSULE
0	0	0
1	88.8	-
2	88.0	1.6
3	51.1	5.2
4	61.2	27.8
5	72.7	36.1
6	80.1	75.5
8	88.8	51.9
8	88.8	63.0
9	92.9	63.0
10	94.0	66.6
4		70.4
12		73.1
10		75.5
14		77.2
15		78.7

EXAMPLE 3MATRIX TABLET WITH A NON-UNIFORM ERODIBLE COATING

Matrix tablets comprising flat faced circular discs of 5/8 inch diameter and 1/8 inch thickness were prepared comprising the following composition:

5	<u>Ingredients</u>	<u>mg/tablet</u>
	Acrylic acid copolymer	330
	Lactose	100
	Pseudoephedrine HCl	120
	Magnesium Stearate	11
10	Total	561

The tablet was annealed at 110°C for 10 minutes to become nondisintegrating in water at pH 2.0. The tablet was coated with an erodible polymer, Eudragit (trademark) L30D (a copolymer of methacrylic acid and methacrylic acid esters), at different levels on each side. For example, 6.9 mg and 13.8 mg on flat surfaces of the tablet and 1.9 mg on the edge side of the tablet. This is illustrated in Figure 3. The tablet was placed in stirred water (pH 2.0) at 37°C. The in vitro release profile as shown in Figure 7 was fairly linear over 14 hours.

The coated and uncoated tablets were placed in the a USP dissolution apparatus containing simulated gastric fluid (U.S.P. XXII test solution, absent enzyme, adjusted to pH 2.0) at 37°C and stirred at 50 rpm. Aliquots of the test fluid were removed, from the apparatus, periodically and assayed for released medication by HPLC using a Nova - Pak C 18 column at a 254 nm detection wavelength.

Table III shows that very little of the medication was released by the coated tablets within the first hour after exposure to the simulated gastric fluid whereas about one third of the medication will have been released from the uncoated tablets during that time. The coated tablets then continued to release the medication at a sustained, approximately constant rate during the next fourteen hours. At that end of that time only about 60% of the contained medication had been released. On the other hand, after the initial rapid release of medication the uncoated capsules had released the medication at a sustained non-constant rate which was greater than that of the coated tablets. As a consequence, about 86% of the medication originally contained in the uncoated tablets was released within ten hours.

-12-

TABLE III

5	TIME (HOURS)	% PSEUDOEPHEDRINE HCl RELEASED FROM UNCOATED DISK SHAPED MATRIX TABLET	% PSEUDOEPHEDRINE HCl RELEASED FROM COATED DISK SHAPED MATRIX TABLET
	0	0	0
	1	34.9	4.4
	2	52.3	8.6
	3	61.9	13.3
10	4	80.0	18.1
	6	76.5	23.0
	6	80.0	29.6
	7	80.0	33.0
	8	80.0	38.4
15	9	80.0	45.5
	10	86.1	48.9
	11		48.9
	12		51.5
	13		54.3
20	14		56.9
	15		59.7

EXAMPLE 4MATRIX TABLET WITH A NON-UNIFORM ERODIBLE COATING

25 The tablet composition of Example 3 was compressed into oblong shaped tablets. These tablets were then annealed at 100°C for 10 minutes to become non-disintegrating in water at pH 2.0. The tablets were then coated with 2% (w/w) Eudragit (trademark) L100, in a Hi Coater (trademark). Because of the shape of the tablets, a coating of non-uniform thickness was obtained as illustrated in Figure 4. The tablet was

30 placed in stirred water (pH 2.0) at 37°C. The in vitro release profile as shown in Figure 8 was fairly linear over 12 hours.

-13-

The coated tablets and their controls were treated as in Example 3. As shown in Table IV, after about one hour of exposure to the test fluid the coated tablets released their contained medication at a sustained, approximately constant rate with only about 64% of the medication being released in at about twelve hours. On the other hand, the uncoated tablets released about one-third of their contained medication within the first hour of exposure. The balance of the contained medication was released at a slower but non-constant rate with almost all of the medication having been released within twelve hours.

TABLE IV

TIME (HOURS)	% PSEUDOEPHEDRINE HCl RELEASED FROM UNCOATED OBLONG SHAPED MATRIX TABLET	% PSEUDOEPHEDRINE HCl RELEASED FROM COATED OBLONG SHAPED MATRIX TABLET
0	0	0
1	30.1	2.1
2	47.5	9.8
3	58.6	17.1
4	67.4	25.0
5	75.3	31.7
6	79.9	37.8
7	86.2	43.7
8	89.9	48.3
9	92.5	53.3
10	93.3	56.2
11	95.3	60.3
12	96.4	63.8

Although specific forms and types of articles have been illustrated it is to be understood that combinations of all types and forms known to the art may be used in preparing the articles of the invention.

Furthermore, it is to be understood that the above proposed theory of operation of the devices of the invention is not a part of the invention.

CLAIMS

1. An improved article for the sustained release of pharmaceuticals comprising a core, containing said pharmaceuticals, at least a part of which is coated with an erodible coating wherein the improvement comprises that the thickness of said coating on said core is not constant.
2. The method of claim 1 wherein the shape of said coating is spheroidal and the shape of the core is selected from the group consisting of ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes with the proviso that if the coating and core both comprise spheroidal shapes they are not concentric .
3. The article of claim 1 wherein the shape of said coating is ellipsoidal and the shape of the core is selected from the group consisting of ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes.
4. The article of claim 1 wherein the shape of said coating is cylindrical and the shape of the core is selected from the group consisting of ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes.
5. The article of claim 1 wherein the shape of said coating is that of a rectangular prism and the shape of the core is selected from the group consisting of ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes with the proviso that if the coating and core are both cubic they are not concentric .
6. The article of claim 1 wherein said coating is erodible by stomach fluids.
7. The article of claim 1 wherein said coating is resistant to stomach fluids and erodible by intestinal fluids.
8. The article of claim 6 wherein said coating comprises a composition selected from the group consisting of polyvinyl pyrrolidone, solid polyethylene glycols, poly (ortho esters), poly ( $\epsilon$ -caprolactone), poly (acrylic acid), poly (vinyl alcohol), hydroxypropylmethyl cellulose, dextran, gelatin, polyacrylamide, polysaccharides, gum arabic, polyphosphates, copolymers of dimethylaminoethyl methacrylate and methacrylic acid esters, copolymers of glutamic acid and ethyl glutamate, polyglycolic acid, polylactic acid, copolymers of lactide and  $\epsilon$ -caprolactone and terpolymers of lactide, glycolide and  $\epsilon$ -caprolactone.
9. The article of claim 7 wherein said coating comprises a composition selected from the group consisting of cellulose acetate phthalate, hydroxypropylmethyl-

cellulose acetate succinate, hydroxypropyl-methylcellulose phthalate and copolymers of methacrylic acid and methacrylic acid esters.

10. The article of claim 1 wherein the core is selected from the group consisting of water soluble capsules, water insoluble porous capsules and matrix  
5 tablets.

11. An improved method for preparing articles for the controlled sustained release of orally administrable pharmaceuticals comprising a core, containing said pharmaceuticals, at least part of which is coated with an erodible coating wherein the improvement consists of applying a non-uniform thickness of coating to the core.

10 12. The method of claim 11 wherein said core is selected from the group comprising water soluble capsules, porous water-insoluble plastic osmotic capsules and matrix tablets.

13. The method of claim 11 wherein the shape of said coating is spheroidal and the shape of the core is selected from the group consisting of ellipsoidal,  
15 cylindrical, rectangular prismatic and spheroidal shapes with the proviso that if the coating and core both comprise spheroidal shapes they are not concentric .

14. The method of claim 11 wherein the shape of said coating is ellipsoidal and the shape of the core is selected from the group consisting of ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes.

20 15. The method of claim 11 wherein the shape of said coating is cylindrical and the shape of the core is selected from the group consisting of ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes.

16. The method of claim 11 wherein the shape of said coating is that of a rectangular prism and the shape of the core is selected from the group consisting of  
25 ellipsoidal, cylindrical, rectangular prismatic and spheroidal shapes with the proviso that if the coating and core are both cubic they are not concentric .

17. The method of claim 12 wherein said coating comprises a rectangular prism and said core comprises a cylindrical matrix tablet.

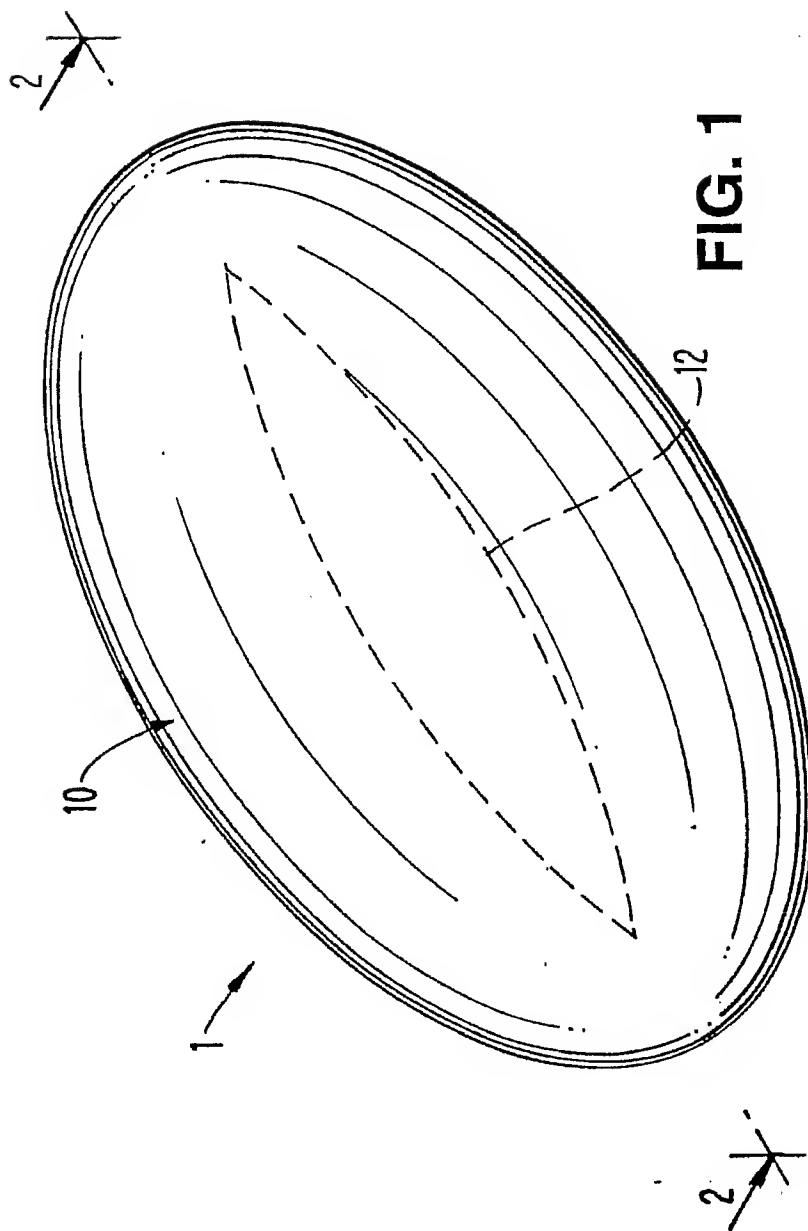
18. The method of claim 12 wherein said coating comprises an ellipsoid and  
30 said core is a cylindrical matrix tablet wherein said matrix is insoluble in aqueous body fluids.

19. The method of claim 12 wherein said coating comprises an ellipsoid and said core is a drug containing ellipsoidal capsule soluble in aqueous body fluids.

-16-

20. The method of claim 12 wherein said coating comprises a cylinder covering only part of the core which comprises a cylindrical osmotic capsule comprising a coating insoluble in, and permeable to, aqueous body fluids.

1/5



2/5

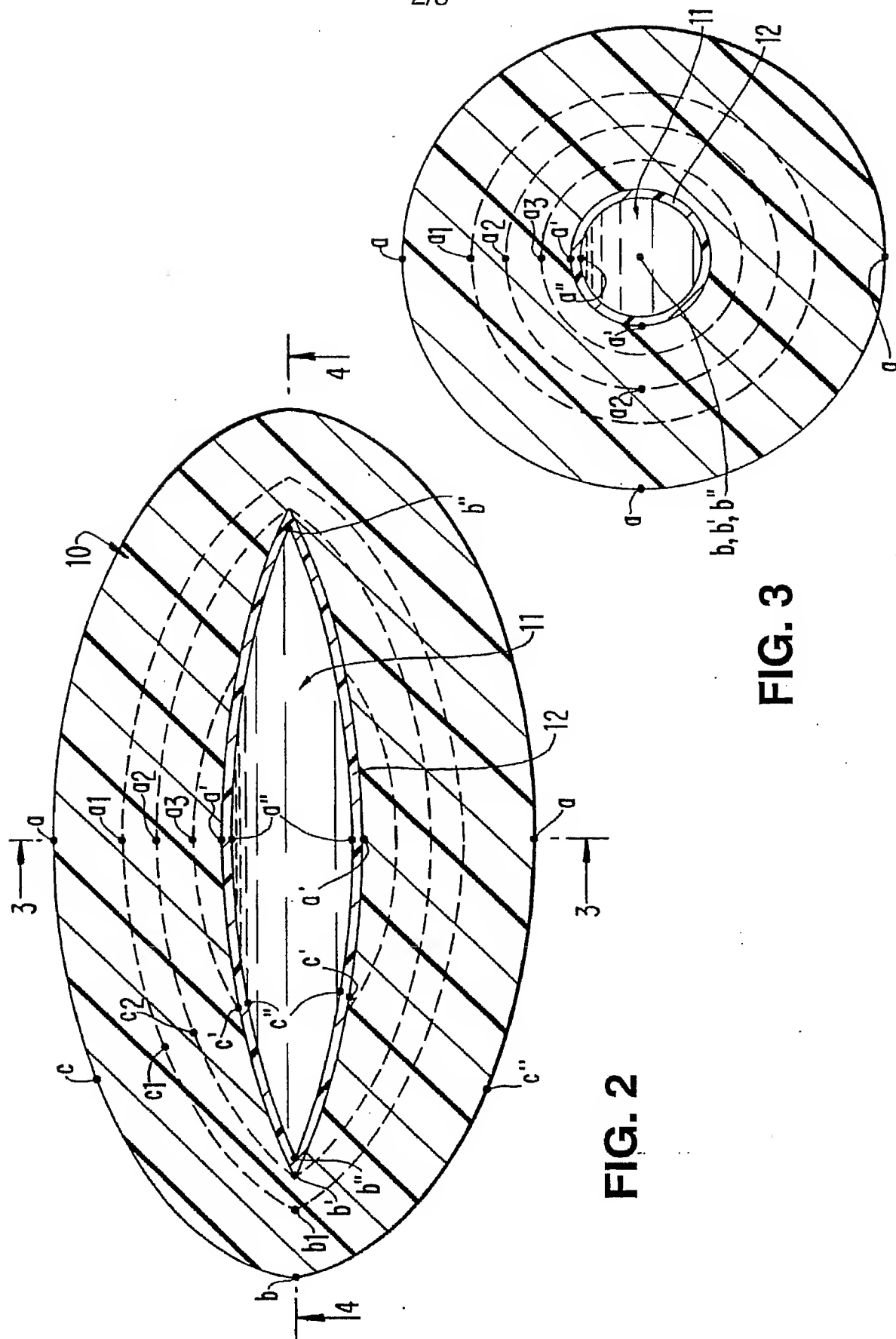
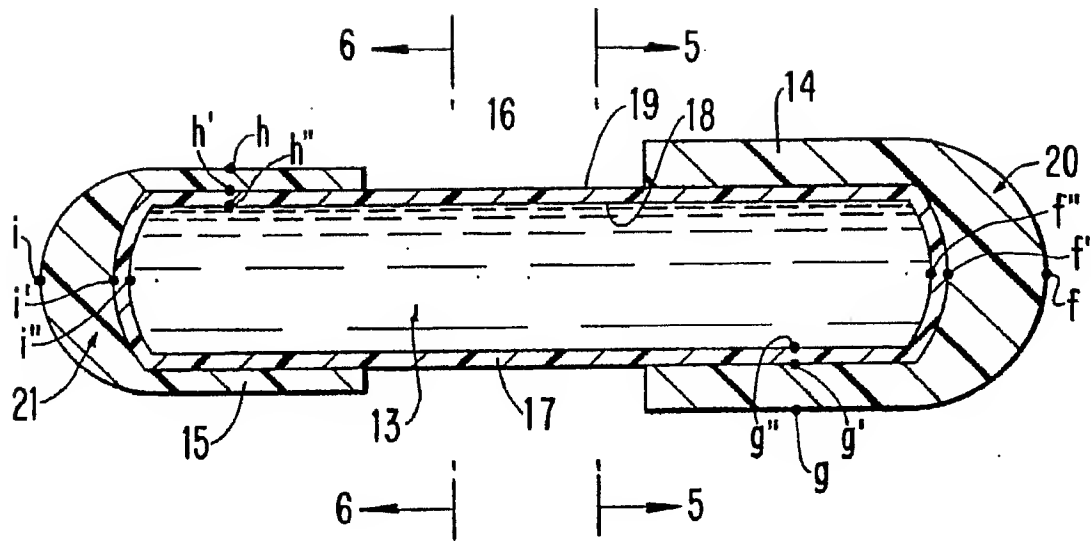
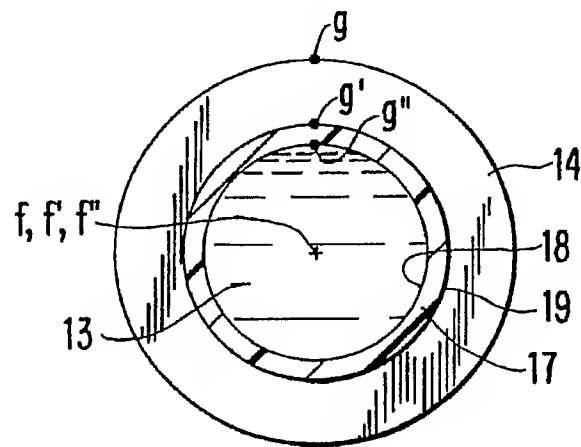
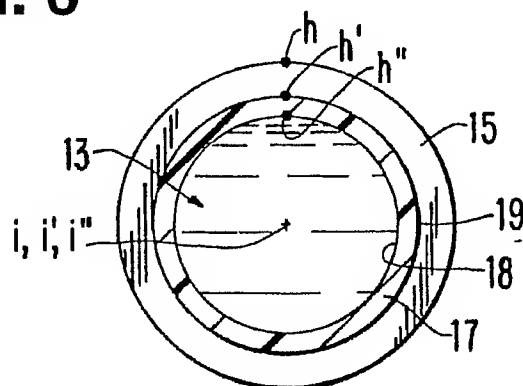


FIG. 3

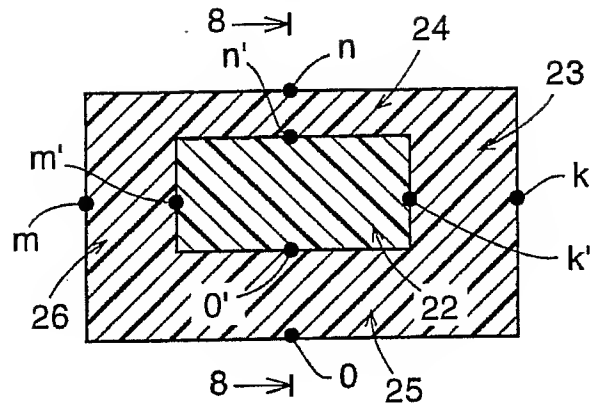
FIG. 2

3/5

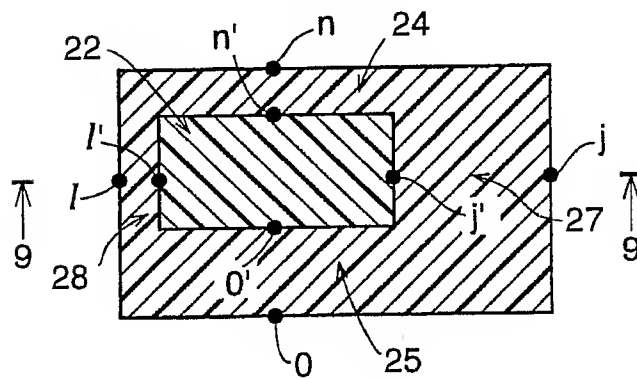
**FIG. 4****FIG. 5****FIG. 6**

4/5

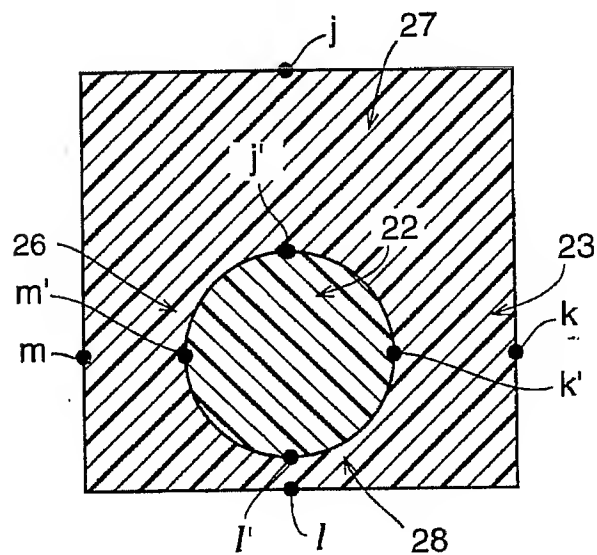
**FIG. 7**



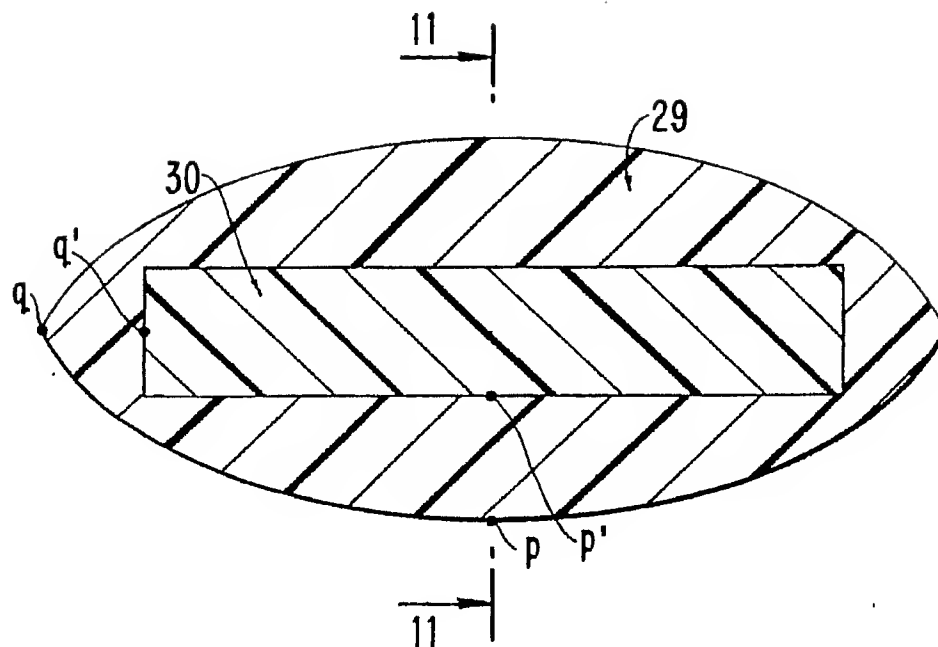
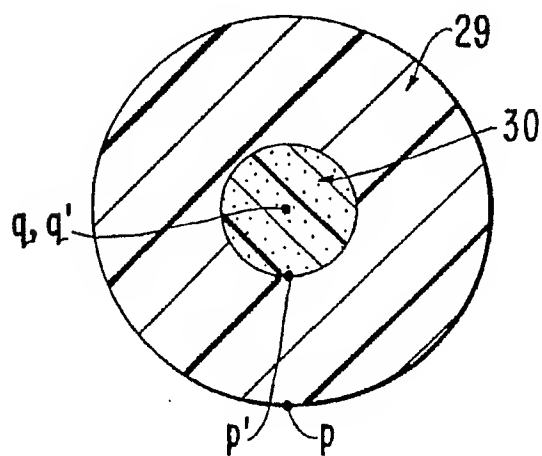
**FIG. 8**



**FIG. 9**



5/5

**FIG. 10****FIG. 11**

## INTERNATIONAL SEARCH REPORT

PCT/US 93/06447

Internatinnal Application No

**I. CLASSIFICATION OF SUBJECT MATTER** (If several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC  
 Int.Cl. 5 A61K9/20; A61K9/28; A61K9/48

**II. FIELDS SEARCHED**Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
Int.Cl. 5	A61K

Documentation Searched other than Minimum Documentation  
 to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>

**III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>**

Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB,A,994 742 (THE WELLCOME FOUNDATION LIMITED) 10 June 1965 see figure 2 see claims 4-6 see page 3, line 9 - line 16 ---	1-20
X	US,A,3 015 610 (ROY Y. SANDERS) 2 January 1962 see figure 2 see column 2, line 40 - line 54 ---	1-20
X	FR,A,1 603 314 (ETABLISSEMENTS WANDER) 5 April 1971 see figure 2 see page 2, line 25 - line 33 ---	1-20
	-/--	

<sup>10</sup> Special categories of cited documents:

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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

**IV. CERTIFICATION**

Date of the Actual Completion of the International Search

05 OCTOBER 1993

Date of Mailing of this International Search Report

94. 10. 93

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

VENTURA AMAT A.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 93/06447

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		Relevant to Claim No.
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	
X	<p>EP,A,0 259 219 (UNIVERSITE DE MONTREAL)</p> <p>9 March 1988</p> <p>see figure 2A</p> <p>see claim 1</p> <p>see page 3, line 15 - line 22</p> <p>-----</p>	1-20

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9306447  
SA 76905

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the European Patent Office EDP file on  
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05/10/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-994742		None	
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US-A-3015610		FR-A- 1259997	
		GB-A- 897141	
		NL-C- 102235	
		NL-A- 234514	
-----			
FR-A-1603314	05-04-71	None	
-----			
EP-A-0259219	09-03-88	US-A- 4816262	28-03-89
		JP-A- 63072623	02-04-88
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(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
6 June 2002 (06.06.2002)

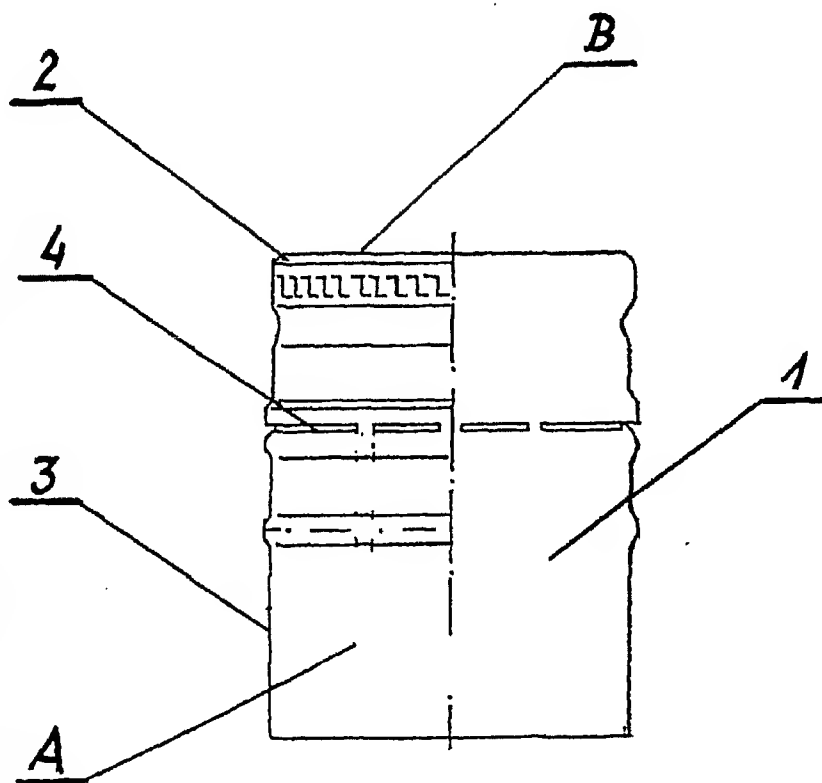
PCT

(10) International Publication Number  
**WO 02/44047 A1**

- (51) International Patent Classification<sup>7</sup>: **B65D 41/34**, 51/24
- (21) International Application Number: **PCT/PL01/00093**
- (22) International Filing Date:  
29 November 2001 (29.11.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
W.111668 1 December 2000 (01.12.2000) PL
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- (54) Agent: **KLASSEK, Maciej, Adam**; "Inventconsult"  
Patent & Trademark Agency, ul. Sowinskeigo 1,  
PL-40-272 Katowice (PL).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report

[Continued on next page]

(54) Title: A BOTTLE CLOSURE WITH MARKINGS



(57) Abstract: The invention relates to the bottle closure, particularly for alcoholic liquors. The bottle closure has a form of a metal cap (1) in a shape of a metal cylinder closed from the top with a bottom (2), where the said cylinder is provided with a circumferential incision (4) and a circumferentially formed pressed stiffening reinforcements and on the outer surface of the top bottom (2) and of a side wall (3) holographic markings of an exercise duty and a producer indication are provided.

WO 02/44047 A1



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## A BOTTLE CLOSURE WITH MARKINGS

The subject of the invention is a bottle closure, particularly for alcoholic liquors.

Hitherto a bottle closure for alcoholic liquors, particularly of a high alcohol content, is a metal cap in a form of a thin-walled cylinder closed from the top, which has a circumferential incision on a side surface.

A cap during a closing operation of a filled bottle, after placing a sealing therein, is overlaid from the top onto the screwed bottle neck, and subjected to the operation of a rotational crimping device which reduces a cap on a screwed neck, forming a closely adherent screw joint.

While opening the bottle, the upper part of a closure is undone which operation causes breaking of a circumferential incision, being a seal.

Such closure can not be reused in its original form and it makes unable refilling the bottle with a content different than an original and legal alcoholic product.

The closure known from the prior art has a marking of a producer laid over the top of a cap. Since in the commodity circulation conditions a paper label band of an exercise duty is stuck on the known bottle closure, mostly the mentioned marking is not visible to the buyer. Furthermore, a label band of an exercise duty made of a paper band is undurable and it easily gets unstuck, which is often in collision with a decoration of a liquor bottle.

Some producers of strong alcoholic liquors use to place their marking in a form of a hologram, which is stuck on the side wall of a bottle preventing the adulteration. However, since bottles are mainly returnable packages and the labels, holograms and an applied glue are of a high quality and of a long term durability, such bottles can be easily filled with a liquor of an unknown origin and closed with a bottle closure known from the prior art., giving a view of an authenticity to the buyers.

The bottle closure according to the utility model enables to avoid the mentioned hazard and inconveniences.

A bottle closure according to the invention is a metal cap in a form of a closed from a top with a bottom, thin-walled , metal cylinder, which has a circumferential incision on a side surface and circumferentially

formed pressed reinforcements , which on its outer surface of the top and on its side wall has a holographic marking of an exercise duty and a producer.

A bottle closure according to the invention relates some functions therein, where the most important are the exercise duty marking, the producer indication, and the protection of a content. While opening, the circumferential incision must be torn and the bottle closure can not be reused.

The bottle closure according to the invention enables to eliminate the use of undurable and offensive paper bands for an exercise duty marking, making at the same unable a falsification of the marking and an illegal filling of a bottle.

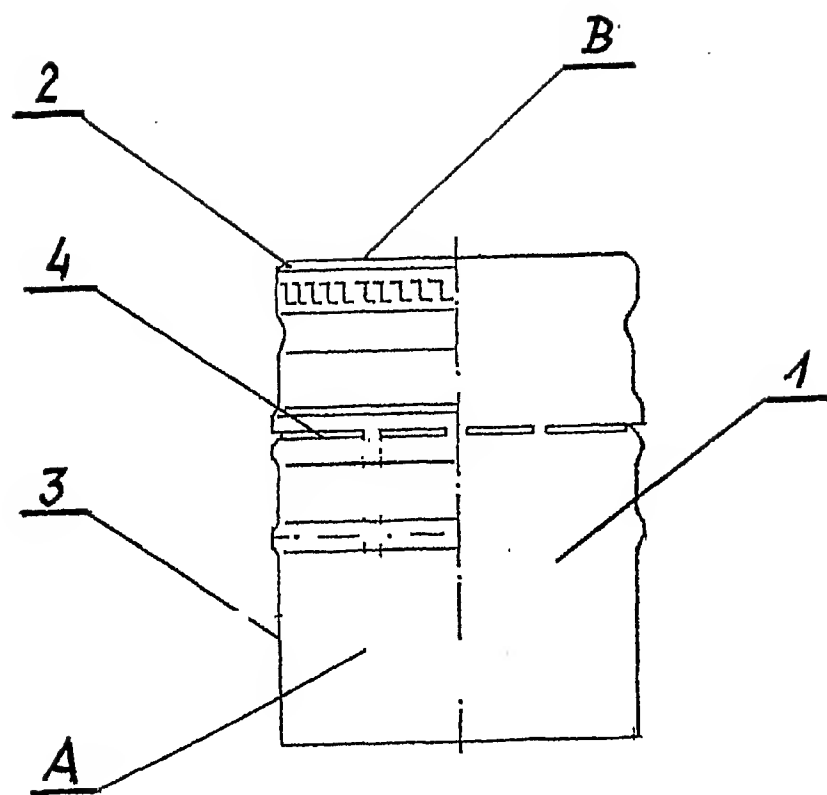
The bottle closure according to the invention is presented on the enclosed drawing, showing a cross-section thereof.

The bottle closure is a metal cap 1 in a form of a closed from a top with a bottom 2, thin-walled metal cylinder, which has a circumferential incision 4 on a side surface 3 and circumferentially formed pressed stiffening reinforcements. On the outer surface of the top bottom 2 and on a side wall 3 the areas A and B are located, wherein a holographic markings of an exercise duty and a producer indication are placed.

## The claim

The bottle closure, particularly for alcoholic liquors, having a form of a metal cap in a shape of a metal cylinder closed from the top with a bottom, where the said cylinder is provided with a circumferential incision and a circumferentially formed pressed stiffening reinforcements, **characterized in, that** on the outer surface of the top bottom 2 and on a side wall 3 the holographic markings of an exercise duty and a producer indication are placed.

1/1



## INTERNATIONAL SEARCH REPORT

ational Application No  
PCT/PL 01/00093

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B65D41/34 B65D51/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B65D G09F G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EP0-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 276 802 A (ANDERSEN & BRUUN LTD) 7 June 1972 (1972-06-07) page 1, column 1, line 13 -column 2, line 58; figure 2	1
X	FR 1 335 483 A (DUBONNET ETS) 16 August 1963 (1963-08-16) figures 1,2	1
X	GB 1 114 897 A (NACKENHEIM VER KAPSELFAB) 22 May 1968 (1968-05-22) page 1, column 1, line 38 -page 2, column 1, line 1; figures 1,3	1
A	WO 98 15939 A (SLEEVEVER INT ;FRESNEL ERIC (FR)) 16 April 1998 (1998-04-16) abstract; figures 1,8 -/--	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the International filing date but later than the priority date claimed

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Date of the actual completion of the International search

11 March 2002

Date of mailing of the International search report

19/03/2002

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk  
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Fax: (+31-70) 340-3016

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Seegerer, H

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/PL 01/00093

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 413 743 A (GOODHUE GEORGE L) 3 December 1968 (1968-12-03) abstract; figures 1,2 -----	1

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/PL 01/00093

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 1276802	A	07-06-1972	NONE	
FR 1335483	A	16-08-1963	NONE	
GB 1114897	A	22-05-1968	CH 428471 A DE 1913980 U FR 1441104 A LU 49121 A NL 6509815 A	15-01-1967  03-06-1966 21-09-1965 19-08-1966
WO 9815939	A	16-04-1998	FR 2754375 A1 AT 200360 T AU 4465797 A BR 9712208 A DE 69704495 D1 DE 69704495 T2 EP 0929886 A1 WO 9815939 A1 US 6254139 B1	10-04-1998 15-04-2001 05-05-1998 31-08-1999 10-05-2001 20-09-2001 21-07-1999 16-04-1998 03-07-2001
US 3413743	A	03-12-1968	NONE	

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
31 October 2002 (31.10.2002)

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(25) Filing Language: English

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(30) Priority Data:  
01303665.2 20 April 2001 (20.04.2001) EP

(71) Applicant (*for all designated States except US*): **CROWN CORK & SEAL TECHNOLOGIES CORPORATION** [US/US]; 11535 S Central Avenue, Alsip, IL 60803-2599 (US).

(71) Applicant (*for LS only*): **CARNAUDMETALBOX PLC** [GB/GB]; Downsview Road, Wantage, Oxfordshire OX12 9BP (GB).

(72) Inventors; and

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(GB). **SENIOR, David** [GB/GB]; 38 Argyle Terrace, Dunblane, Perthshire, Tayside FK15 9DN (GB). **SHARPE, John** [GB/GB]; 63 Abbot Road, Stirling, Central Scotland FK7 7UQ (GB).

(74) Agent: **SMITH, Debra, Jane, Clare**; CarnaudMetalbox Plc, Downsview Road, Wantage, Oxfordshire OX12 9BP (GB).

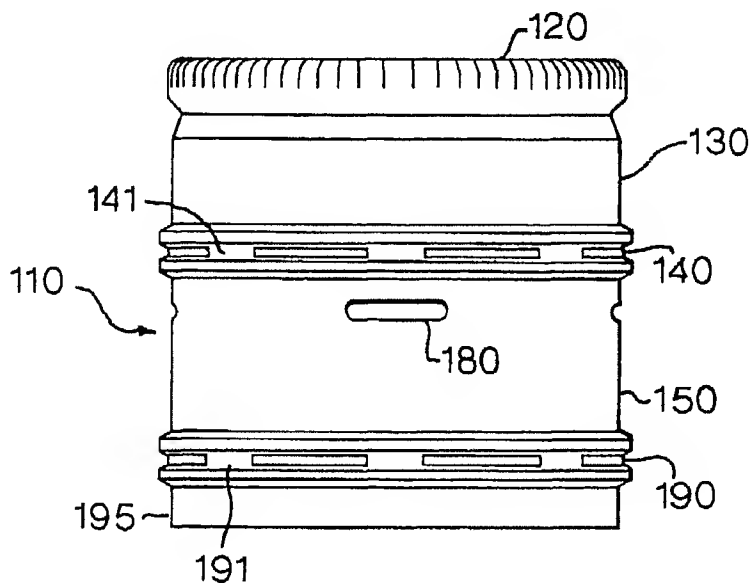
(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

[Continued on next page]

(54) Title: A CLOSURE



(57) Abstract: The combination of a closure (110) and an in-bore fitment (201) is provided for a container. The closure (110) comprises a generally plain crown (120) with a tubular skirt (130) depending from its periphery. The tubular skirt (130) has a first weakened zone (140) defining a first tamperevident portion (150); the first weakened zone (140) is adapted to break on first opening of the container. The tubular skirt (130) has a second weakened zone (190) defining a second tamperevident portion (150). The second weakened zone (190) is protected from breakage on first opening of the container but is arranged to break if an attempt is made to remove the in-bore fitment (201) from the container.

WO 02/085730 A1



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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### A CLOSURE

The present invention relates generally to a closure for a container, and particularly to a closure of the type comprising a generally plain crown with a tubular skirt depending from the periphery thereof. An example of this type of closure is a metal (such as aluminium) shell, most commonly used as a closure for bottles containing spirits.

In general the tubular skirt of this type of closure has a circumferential line of weakening which defines a break band. The break band is in some way secured to the bottle, for example by rolling part of it under the bottle transfer bead, so that when the closure is first opened it is split along the line of weakening. The uppermost part of the closure then serves as a cap for reclosing the bottle and the break band is retained on the bottle. The top cap and lower break band are irreversibly separated and this provides visual evidence that the bottle has been opened.

An example of such a closure is shown in Fig.1. The closure (10) comprises a generally plain crown (20) with a tubular skirt (30) depending from the periphery thereof. The tubular skirt (30) has a circumferential line of weakening (40) which divides the closure into an upper top cap (45) and a lower tamperevident break band (50).

In many cases, and particularly in bottles for spirits, an in-bore fitment such as a non-return fitment is provided. The non-return fitment (not shown) can be secured within the closure (10) by four circumferentially

spaced retaining dimples (80) which extend into a retaining channel of the fitment. The fitment may be held in a bottle by turning the free end (31) of the closure skirt (30) under the transfer bead of the bottle neck and/or by retaining fins present on the fitment which jam it into the bottle neck. As such, when the top cap (40) is rotated to open the bottle, the skirt (30) breaks along the line of weakening (40) so that the cap (40) is removed. The lower break band (50) remains in place on the bottle neck, held by its connection to the fitment and by the turned under free end (31). If the fitment is removed, which may be the case if unwanted refilling of the bottle is attempted, the lower break band is generally unaffected.

Whether or not the lower break band is removed with the non-return fitment there is no visible evidence that the fitment has been removed, other than perhaps the presence or absence of the break band. The present invention seeks to address the lack of such a secondary tamperevident feature.

Accordingly there is provided a closure and an in-bore fitment for a container, the closure comprising a generally plain crown with a tubular skirt depending from the periphery thereof, the tubular skirt having a first weakened zone defining a first tamperevident portion and adapted to break on first opening of the container, the fitment is secured within the bore of the container by the closure, characterised in that, the tubular skirt has a second weakened zone defining a second tamperevident portion axially spaced from the first tamperevident

portion, at the free end of the skirt, the second weakened zone is protected from breakage on first opening of the container but is arranged to break on attempted removal of the fitment from the container.

By providing the second weakened zone and protecting it from breakage upon first opening the present invention provides a secondary tamperevident feature. The second weakened zone is unaffected by normal opening and closing of the container but is broken in response to removal of, or preferably simply an attempt to remove, the fitment.

The closure may be formed from metal, although it will be appreciated that this is not essential for the working of the invention. Other materials such as plastics may also therefore be used.

In a preferred embodiment the first and second weakened zones are formed by a circumferential line of weakening. Other forms of weakening, such as longitudinal lines of weakening, are not beyond the scope of the invention and all that is required is a frangible connection between adjacent parts.

The second tamperevident portion may be adapted to be secured to the container. The second portion may be secured for example by turning the free end of the skirt under a projecting rim of the container, such as the transfer bead of a bottle neck. It may be preferred that the second portion is permanently secured to the container to prevent removal and refitting of a completely new closure.

The first and/or second tamperevident portion may be a circumferential band.

The first and second tamperevident portions may be prevented from separation on first opening by securing the first tamperevident portion to the fitment; this prevents axial movement independently thereof.

The second weakened zone may be adapted to break by securing the second tamperevident portion to the container. In a preferred embodiment the second tamperevident portion is restrained from movement but the second weakened zone is not protected from breakage if the fitment is removed.

The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Fig.1 is a side view of a prior art closure;

Fig.2 is a side view of a closure according to the present invention;

Fig.3 is a section through a bottle neck shown fitted with a pouring fitment and closed by the closure of Fig.2;

Fig.4 shows the arrangement of Fig.3 in which a first weakened zone has been broken on first opening of the closure; and

Fig.5 shows the arrangement of Fig.4 in which the pouring fitment has been removed.

Referring to first to Fig.2 there is shown a closure 110 comprising a generally plain crown 120 with a tubular skirt 130 depending from the periphery thereof. The tubular skirt 130 has a first circumferential line of weakening 140 which frangibly connects an upper top cap 145 and a first tamperevident break band 150. Four

circumferentially spaced retaining dimples 180 are provided at the top of the first tamperevident portion 150. The tubular skirt 130 has a second circumferential line of weakening 190 below the first circumferential line of weakening 140. The second circumferential line of weakening 140 defines a second tamperevident break band 195. The circumferential lines of weakening 140, 190 comprise a plurality of circumferentially spaced frangible bridges 141, 191.

Referring now to Fig.3, there is shown a bottle neck 200 and an in-bore non-return pouring fitment generally indicated 201 which is secured within the bottle neck and also within the closure 110. The pouring fitment 201 will be well known to those skilled in the art and comprises, briefly, a lower feed cylinder 202 which includes a one way valve arrangement involving a glass ball 203 held captive in a valve chamber 204 and a valve member 205 which is movable between a lower closed position and a raised open position. At the top of the feed cylinder 202 the fitment is flared at a shoulder 206 which is of a diameter greater than that of the bottle neck 200 so that the fitment is pushed into the bottle to the top of the feed cylinder and is sealed in the bottle neck using a silicone washer 207 or the like. Above the shoulder 206 a cylindrical upper section 208 of the fitment includes a pouring spout 209. The outside of the cylindrical upper section has two threads 211.

Just above the shoulder 206 the upper section 208 of the fitment has a circumferential retaining channel 181. In practice the fitment 201 is pushed into the closure

110 so that the dimples 180 of the closure engage into the retaining channel 181 of the fitment. The fitment/closure assembly is then applied together to the bottle neck and the closure is then "rolled on" to the fitment and the bottle neck. The technique of rolling on will be well known to those skilled in the art and involves passing the closure through a series of rollers in which the closure conforms to the shape of specific parts of the neck and the fitment where required. In this process the closure is pushed around the threads of the fitment as shown and in addition the free end 131 of the skirt is turned under the transfer bead 192 of the bottle neck. The top of the upper section 208 of the pouring fitment is sealed against the underside of the crown 120 of the closure by a sealing wad 121. The fitment 201 is now secured in the bore of the bottle neck by the closure 110.

Referring now to Fig.4, the combination of the closure, pouring fitment and bottle neck is shown following first opening of the bottle top. In this process the upper top cap 145 is twisted off the bottle using the threads 211 and this breaks the frangible bridges 141 of the first circumferential line of weakening 140 so that the upper top cap 145 can be removed as shown. Whilst the top cap 145 can be replaced by screwing it back on the fitment threads 211 the frangible bridges 141 have been irreversibly broken and this separation is visibly obvious to indicate that the bottle has been opened.

As the bottle is first opened and the top cap 140 is removed the second circumferential line of weakening 190 is protected from breakage because there is no relative axial or rotational movement between the break band 150 and the break band 195.

An attempt may be made to remove the pouring fitment 201 from the neck of the bottle, for example in an attempt to bypass the one-way valve of the pouring fitment to re-fill the bottle. It will be seen that if the fitment is removed it will lift the break band 150 by virtue of the attachment via the dimples 180 and the channel 181. However, the second tamperevident break band 195 is held on the transfer bead 192 of the bottle so that if the fitment is removed the first break band 140 will be torn away from the second break band 195 due to breakage of the second circumferential line of weakening 190. As shown in Fig.5, the second break band 195 remains on the neck 200 of the bottle as visual evidence that the pouring fitment has been removed.

**CLAIMS:**

1. In combination, a closure (110) and an in-bore fitment (201) for a container (200), the closure comprising a generally plain crown (120) with a tubular skirt (130) depending from the periphery thereof, the tubular skirt (130) having a first weakened zone (140) defining a first tamperevident portion (150) and adapted to break on first opening of the container, the fitment is secured within the bore of the container by the closure,

characterised in that,

the tubular skirt (130) has a second weakened zone (190) defining a second tamperevident portion (195), axially spaced from the first tamperevident portion, at the free end of the skirt, the second weakened zone is protected from breakage on first opening of the container but is arranged to break on attempted removal of the fitment from the container.

2. A combination according to Claim 1, wherein the fitment (201) is secured to the closure (110) between the first (140) and second (190) weakened zones.

3. A combination according to Claim 1 or Claim 2, wherein the fitment (201) is secured by an inward crimping (80) of part (150) of the skirt (130).

4. A combination according to any of Claims 1 to 3, wherein the fitment is secured by an inward crimping (80) of the first tamperevident portion (150).

5. A combination according to any preceding claim, wherein the first (140) and/or second (190) weakened zone is formed by a circumferential line of weakening.

6. A combination according to any preceding claim, wherein the second tamperevident portion (195) is adapted to be secured to the container (200).

7. A combination according to any preceding claim, wherein the first (150) and/or second (195) tamperevident portion is a circumferential band.

8. A combination according to any preceding claim, wherein the closure (110) is formed from metal.

1/3

Fig.1.

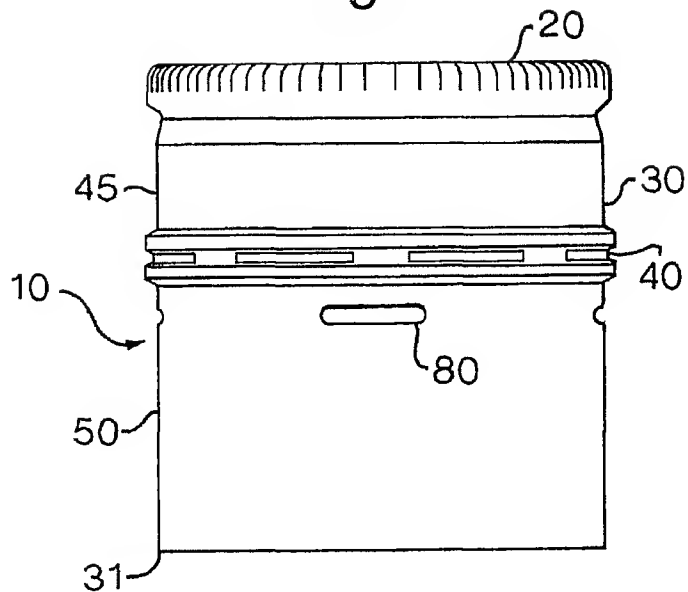
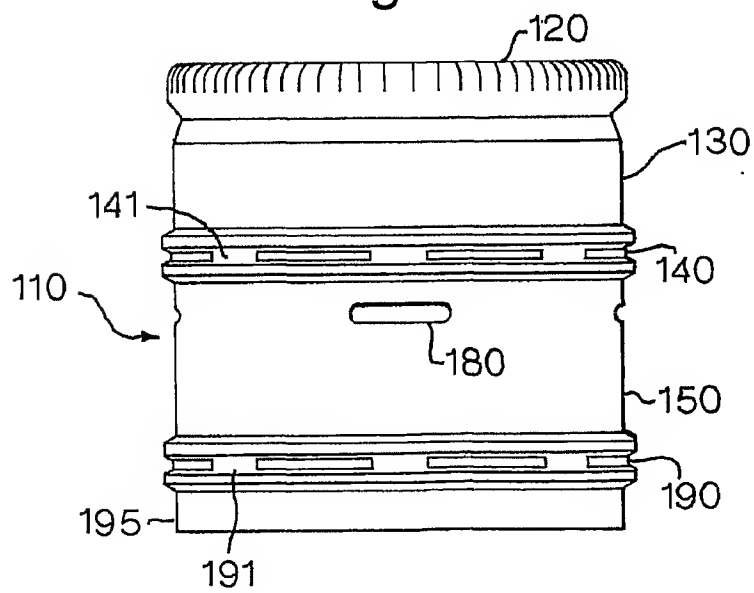


Fig.2.



2/3

Fig.4.

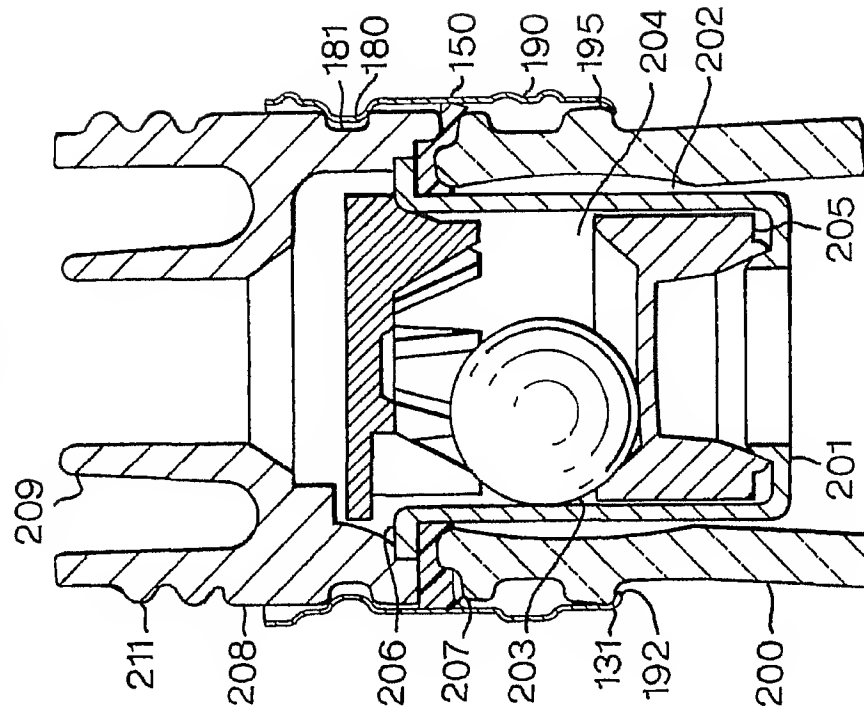
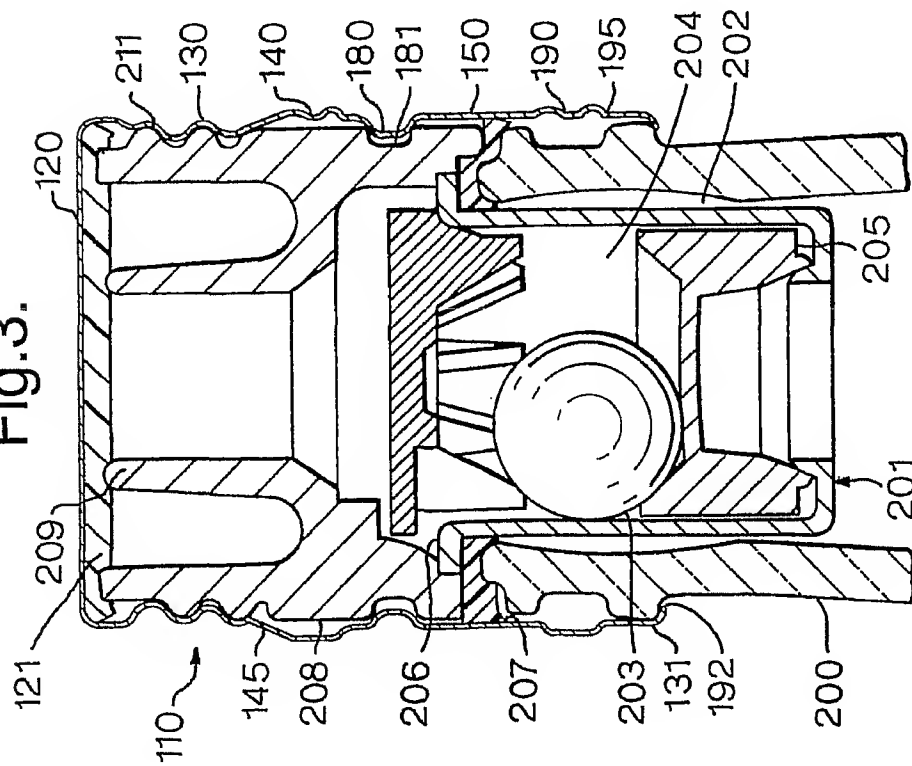
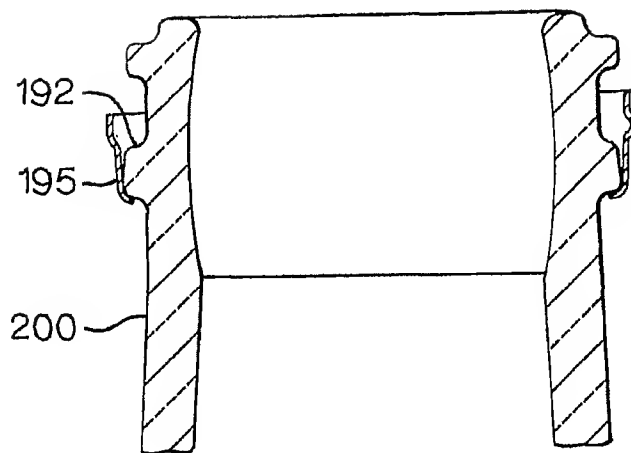


Fig.3.



3/3

Fig.5.



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 02/03482

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B65D41/34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 39 06 164 A (BERG JACOB GMBH CO KG) 20 September 1990 (1990-09-20) column 2, line 48 -column 3, line 9; figure 1	1
A	DE 31 49 780 A (HANSEN GERHARD) 30 June 1983 (1983-06-30) page 4, last paragraph -page 5, paragraph 2; figure 1	1
A	US 4 569 464 A (WASSILIEFF VICTOR) 11 February 1986 (1986-02-11) column 3, line 4 - line 13; figure 1	1
A	EP 1 065 150 A (SAN BENEDETTO ACQUA MINERALE) 3 January 2001 (2001-01-03) column 5, line 46 -column 6, line 6; figure 2	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

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\*O\* document referring to an oral disclosure, use, exhibition or other means

\*P\* document published prior to the International filing date but later than the priority date claimed

\*T\* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*Z\* document member of the same patent family

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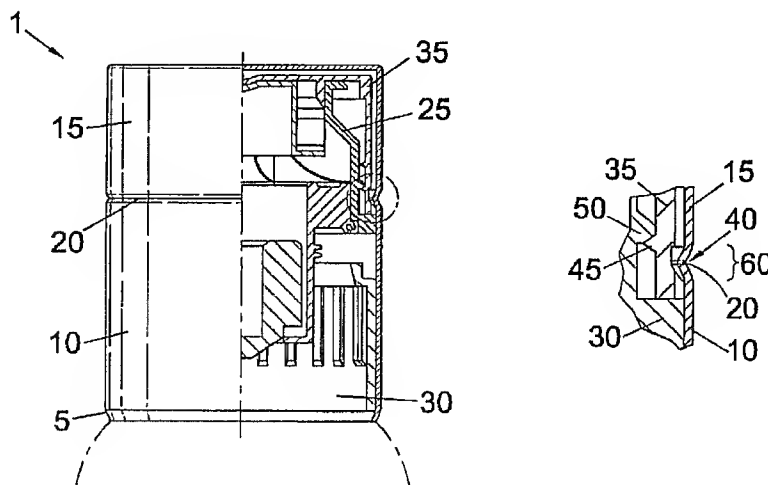
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[Continued on next page]

(54) Title: TAMPER-EVIDENT DEVICE



(57) Abstract: There is disclosed a tamper-evident device (1, 101, 201) for a closure assembly adapted to be applied to a mouth of a container (3), for example, a neck of a bottle. There has been identified a need for an improved tamper-evident device which does not have any parts which are removed upon initial opening and which are liable to be reattached by counterfeits or the like. Accordingly the present invention provides a tamper-evident device (1, 101, 201) comprising a sleeve member (5, 105, 205) which comprises a first portion (10, 110, 220) associated with a second portion (15, 115, 215) by means of a frangible portion (10, 110, 220) therebetween, and wherein said first portion (10, 110, 210) is adapted to be applied to a mouth and neck portion (4) of a container (3), and said second portion (15, 115, 215) is associated with a container closure member (35, 135, 235), and wherein an initial container opening operation causes said frangible portion (20, 120, 220) to fracture or break such that when the container (3) is reclosed said first and second portions (10, 110, 210) are located in a spaced apart relationship to one another.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

TAMPER-EVIDENT DEVICEFIELD OF INVENTION

5 The present invention relates to a tamper-evident device for a closure assembly adapted to be applied to a mouth of a container, for example, a neck of a bottle. The invention particularly, though not exclusively, relates to a tamper-evident non-refillable snap-on fitment.

10 BACKGROUND TO INVENTION

For various reasons, it may be desirable to ensure that a used container, such as a bottle intended to contain a liquid (eg spirits such as alcoholic beverages), is not re-filled with a replacement quantity of another liquid, 15 the characteristics and quality of which may differ from the original contents. Attempts to provide closures which make such re-filling difficult are not always proof against determined tampering. While it is considered advantageous to provide a tamper-indicating means which provides 20 evidence that the bottle and its original contents are intact, if the bottle is resealable with a substitute cap or closure, there may be little to indicate to a purchaser that the bottle has been tampered with and that the contents may be inferior to the original contents.

25 It has, therefore, been found desirable to provide a closure which cannot be removed without an extreme level of effort, or breakage being caused to the bottle. Such an arrangement is shown, for example, in GB Patent No 2 274 837 also by the present Applicant, selected merely by way 30 of illustration.

Whilst it is very important that an original closure cannot be removed without visible damage or breakage being caused either to the closure and/or to the bottle, it has been found that a closure that cannot readily be removed 35 will become the target of attempts to re-fill the container by overcoming the feature provided in the closure intended

to hinder or prevent such refilling. Therefore, in addition to providing devices to prevent re-filling of bottles, there is a need to provide such devices with further tamper-indicating features which, while not acting  
5 in any preventive role, give a clear irremovable and/or irreversible indication that a bottle has been opened since being originally filled with the genuine contents. Such clear indicators have been somewhat lacking in previous closure designs.

10 Furthermore, there is a need for simple designs of closure assemblies allowing easy and reliable manufacture, assembly and fitting to bottle necks. Such simplicity has been somewhat lacking in previous closure designs.

It is an object of at least one aspect of the present  
15 invention to provide an improved tamper-evident device which does not have any parts which are removed upon initial opening and which are liable to be reattached by counterfeiters or the like.

20 It is also an object of a least one aspect of the present invention to obviate or at least mitigate at least one of the aforementioned problems/disadvantages in the prior art.

## 25 SUMMARY OF INVENTION

According to a first aspect of the present invention, there is provided a tamper-evident device comprising a first sleeve member which comprises a first portion associated with a second portion by means of a frangible  
30 portion therebetween, and wherein said first portion is adapted to be applied to a mouth and neck portion of a container, and said second portion is associated with a container closure member, and wherein an initial container opening operation causes said frangible portion to fracture  
35 or break such that when the container is reclosed said first and second portions are located in a spaced apart

relationship to one another.

The Applicant has named the device of the invention the "ALUsnap" (Trade Mark) Tamper-Evident device.

Preferably the frangible portion is provided adjacent  
5 respective circumferential edges of each of the first and second portions.

Either or both of the respective circumferential edges may retract or recoil away from the other during a container opening operation when the frangible portion  
10 fractures or breaks.

The retraction or recoil is preferably accompanied by a concomitant circumferential contraction of at least one of the edges inwardly of the respective first or second portion to provide at least one edge having a smaller  
15 circumference than an adjacent portion of the respective first or second portion.

The retraction or recoil movement is important because it advantageously results in a permanent deformation of the first and/or second portions such that when the container  
20 is reclosed the circumferential edges, do not abut together thus revealing a void or gap located between the first and second portions. This visual indicator evidences that the container (and tamper-evident device) has been opened.

Preferably, the container closure member includes a  
25 circumferential groove which may further provide a circumferential lip portion located below and adjacent to the circumferential groove.

Preferably, during an initial container opening operation, the first circumferential edge recoils/retracts  
30 and circumferentially contracts into the circumferential groove to become positioned circumferentially behind the circumferential lip. This action positions the circumferential lip between the first and second circumferential edges in an obstructive manner such that  
35 when the container is reclosed by re-applying the closure member, the first and second portions of the first sleeve member are spaced apart by the circumferential lip portion

located therebetween.

The frangible portion is generally located in a circumferential groove provided between or adjacent the first and second portions of the sleeve member.

5        Preferably the frangible portion is located substantially at an apex or base of the groove.

The frangible portion may be provided as a continuous weakened portion such as a circumferential scored line or alternatively the frangible portion may comprise  
10        intermittent shearable links which join the first portion to the second portion or a combination of these.

The first edge of the first portion may provide a circumferential first beaded portion on the first portion and in a same manner the edge of the second portion may  
15        provide a circumferential second beaded portion on the portion.

The first sleeve member may comprise any suitable material and preferably this material comprises a metal, or metallic based material.

20        Preferably the metal or metallic based material substantially comprises aluminium, or an alloy thereof particularly rolled aluminium.

Without wishing to be bound by theory, when the first sleeve member comprises rolled aluminium, the retraction,  
25        recoil and/or contraction on breakage of the frangible portion is believed to be due to release of a tension introduced into the aluminium during forming of the sleeve member.

30        Also, advantageously, aluminium provides a good medium for application of printing dyes, inks, paints or the like such that messages, logos, images, names, and other information may be carried by the sleeve member.

The container closure member may be a cap which  
35        desirably includes a threaded portion which allows a rotational movement of the cap during a container opening operation.

The container is preferably a bottle.

The tamper-evident device may include a pouring outlet device adapted to be secured to the mouth of a container for liquid, the container closure member may be a cap adapted to close an outlet of the pouring outlet device, and the sleeve member may be adapted to receive at least part of the pouring outlet device.

Preferably the second portion of the sleeve member is adapted to receive at least part of the cap.

The cap is generally received in a tight interference fit to the second portion, but may be optionally rotatable with respect to the second portion of the sleeve member upon application of sufficient force.

The pouring outlet device is desirably a non-refillable and/or a non-removable device.

Desirably the pouring device comprises a further sleeve member which is adapted to lie around the mouth and neck portion of the container and further comprises a valve seat body which is at least partially receivable within at least part of the neck portion of the container, and wherein the valve seat body is at least partially surrounded by the further sleeve member.

At least the first portion of the sleeve member is preferably adapted to receive at least part of the second sleeve member, preferably in a tight interference fit but optionally rotatable with respect to the further sleeve member upon application of sufficient force.

Preferably the circumferential groove of the sleeve member is located within a circumferential groove provided on the cap. This positioning ensures that when the container is opened by twisting the cap, and fracturing or breaking the shearable links, the edge of the second portion of the sleeve member remains within the groove provided on the cap, and the edge of the first portion of the sleeve member progressively moves out of the groove provided on the cap as the cap is removed away from the pouring outlet device and the first portion. On removing

the contact between the cap and the first portion of the first sleeve member, the first edge retracts to cause a contraction of circumference such that the resulting circumference is less than that of a cap portion which is  
5 located below the groove therein. This cap portion is preferably provided as a circumferential lip on the cap.

When the cap is re-applied to the pouring outlet device, a stop position is reached when the circumferential lip of the cap rests or sits upon the first edge of the  
10 first portion of the sleeve member, thus preventing the cap being returned to its original starting position. A gap or void remains between the first and second portions of the first sleeve member thus exposing the circumferential portion of the cap, which includes the circumferential lip  
15 which was originally encased or enclosed within the first sleeve member. A void may also exist between the lower edge of the cap and a cap seating surface of the pouring device.

Advantageously the exposed circumferential portion of  
20 the cap may be distinctly coloured and/or printed with information, promotional messages or the like.

According to a second aspect of the present invention, there is provided a container including a tamper-evident device as hereinbefore described.

25 The container is preferably a container for liquid which further includes a pouring outlet device as hereinbefore described.

The container may be a glass bottle, and may be adapted for containment of liquid, such as alcoholic drinks  
30 or beverages, eg spirits such as vodka, whisky, brandy, gin or the like.

According to a third aspect of the present invention there is provided a combination of a container and a tamper-evident device according to the first aspect of the  
35 invention.

According to a fourth aspect of the present invention there is provided an alcoholic drinks product comprising an

alcoholic substance packaged in the combination according to the third aspect.

According to a fifth aspect of the present invention there is provided a method of manufacturing a tamper-evident device comprising the steps of:

- (a) providing a sleeve member;
- (b) providing a pouring outlet device comprising a further sleeve member adapted to be secured to a mouth or neck portion of a container for liquid, and a container closure member releasable securable to the further sleeve member;
- (c) disposing the pouring outlet device at least partly within the sleeve member;
- (d) forming a substantially circumferential frangible portion around the sleeve member.

This method is particularly advantageous in mass production.

Preferably, the method includes the further step of securing the sleeve member and pouring outlet device one to the other by forming a lip on an open end of the sleeve member so as to entrap the pouring outlet device within the sleeve member.

The tamper-evident device so formed may comprise a unitary assembly for snap-on application to a mouth and neck portion of a container.

#### BRIEF DESCRIPTION OF DRAWINGS

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings which are:

Figure 1(a) a partially cut-away side view of a tamper-evident device according to a first embodiment of the present invention prior to initial opening in combination with a pouring outlet device and bottle neck shown

in phantom lines;

- Figure 1(b) an enlarged view of the circled part of the  
tamper-evident device of Figure 1;
- 5 Figure 2 a partially cut-away side view of the  
tamper-evident device of Figure 1(a) in use  
with the closure member removed;
- 10 Figure 3(a) a partially cut-away side view of the  
tamper-evident device of Figure 1(a) with  
the closure member re-applied;
- Figure 3(b) an enlarged view of the circled part of the  
15 tamper-evident device of Figure 3(a);
- Figure 4 an exploded perspective view of the tamper-  
evident device of Figure 1 including a  
pouring outlet device and in combination  
20 with a bottle having a mouth and neck;
- Figure 5(a) a partially cut-away side view of a tamper-  
evident device according to a second  
embodiment of the present invention in  
25 combination with a pouring outlet device and  
bottle neck shown in phantom lines;
- Figure 5(b) an enlarged view of the circled cut-away  
view of Figure 5(a).
- 30 Figure 6 a partially cut-away view of the tamper-  
evident device of Figure 5(a) in use with  
the closure member removed;
- 35 Figure 7(a) a partially cut-away side view of the

tamper-evident device of Figure 5(a) with the closure member re-applied;

Figure 7(b) an enlarged view of the circled part of the  
5 tamper-evident device of Figure 7(a);

Figure 8 a cross-sectional view a tamper-evident  
device according to a third embodiment of  
the present invention during initial steps  
10 of manufacture;

Figure 9 a cross-sectional view of the tamper-evident  
device of Figure 8 during an intermediate  
step of manufacture; and

15 Figure 10 a cross-sectional view of part of the  
tamper-evident device of Figure 8 after  
manufacture and prior to initial opening.

20 DETAILED DESCRIPTION OF DRAWINGS

With reference initially to Figure 1(a), there is shown a tamper-evident device, generally designated 1, according to a first embodiment of the present invention. The device 1 comprises a first sleeve member 5 which  
25 comprises a first portion 10 associated with a second portion 15 by means of a frangible portion 20 therebetween. The sleeve member has a closed distal end and an open proximal end. The first portion 10 is adapted to receive a further sleeve member 30 which is part of the pouring  
30 outlet device 25 which in this embodiment is a non-refillable and non-removable device. A lower section of the further sleeve member 30 fits within the first portion 10 in a tight interference fit but rotatable with respect to the first portion 10.

35 The second portion 15 is associated with a container closure member, shown as cap 35, which is received within

the second portion 15 in a tight interference fit but rotatable with respect to the second portion 15.

Referring to Figure 1(b), the first portion 10 of the sleeve member 5 is shown associated with the second portion 15 of the first sleeve member 5 by means of the frangible portion 20. Portions 10 and 15 are in a close interference fit with further sleeve member 30 and cap 35 respectively.

The frangible portion 20 is located within groove 40 on the sleeve member 5, which is provided between the first and second portions 10, 15. Groove 40 is shown located within a further groove 60 provided on cap 35. Also shown is a threaded portion 45 on cap 35 which engages with a corresponding threaded portion 50 provided on the further sleeve member 30.

In use, the cap 35 is rotated (normally anti-clockwise) in an initial container opening operation which causes the frangible portion 20 to break as described below.

Referring to Figure 2, the cap 35 and second portion 15 associated therewith is shown in a removed or open position away from the pouring device 25 which clearly shows the first portion 10 still associated with the second sleeve 30.

Referring to Figure 3(a), the cap 35 and second portion 15 associated therewith is shown re-applied or reclosed to pouring outlet 25, and the first and second portions 10, 15 respectively are clearly shown in a spaced apart relationship to one another due to the appearance of gap 55.

Referring to Figure 3(b), there is shown groove 60 provided on cap 35 and edge 80 of the second portion remaining within groove 60. Edge 75 of first portion 10 is shown in a circumferential contracted state having moved out of groove 60 upon removal of cap 35 from pouring outlet device 25. A portion of the cap 35 which is located below groove 60, shown as lip 65, rests upon the first edge 75

resulting in a void 70 which remains between the lower edge 85 of cap 35 and the cap seating surface 90 of second sleeve member 30. Lip 75 is clearly visible to an observer because it is positioned in gap 55 between the first and second portions 10 and 15.

In this embodiment the first sleeve member 5 is made from rolled aluminium, and the frangible portion 20 is formed from nine shearable links (not shown) which shear on relative twisting of cap 35 (and associated second portion 15) and the pouring outlet device 25 (and associated first portion 10).

Furthermore the aluminium sleeve 5 may be coated with inks or paint or the like, and may be further provided with printed matter and advantageously good reproducibility of colours is obtained when using coloured printed matter.

Referring now to Figure 4, there is shown an exploded perspective view of tamper-evident device 1 comprising sleeve member 5, cap 35, pouring outlet device 25 and also shown is a mouth and neck portion 4 of a container or bottle 3.

The pouring outlet device 25 comprises of a further sleeve member 30 having apertures 27a, 27b and 27c (27c not shown) with projection means 33a, 33b and 33c (33c not shown) located on the lower edges of the apertures 27a, 27b and 27c respectively. The further sleeve member 30 further has a pouring lip 34, inner surface ribs 37 and a thread portion 50.

The projection means 33a, 33b and 33c are movable radially of the further sleeve member 30 in a stiffly resilient manner, and are resiliently engagable with an outer lip portion of the container which in this embodiment is shown as shoulder 6 of the bottle neck portion 4.

In this embodiment twenty-four ribs 37 are formed and arranged circumferentially on an inner surface of the second sleeve member 30. When the pouring outlet device 25 is applied to bottle neck 4, in use, these ribs 37 co-act with raised ridges 7 on the outer surface of the bottle

neck 4 to help prevent undesired rotational movement of the second sleeve member 30. Some minor rotational play in either a clockwise or anticlockwise direction may occur until a stop position is found by a rib or ribs 37 acting  
5 against a raised ridge or ridges 7. However, continued application of force will cause the first portion 10 and/or second portion 15, to rotate relative to the further sleeve member 30 and/or cap 35, respectively.

A valve seat body 42 and a valve member 44 are also  
10 shown. A tubular portion 43 of the valve seat body 42 is adapted to be received within the mouth portion 6 of the bottle.

The first portion 10 and second portion 15 of the first sleeve member 5 are attached by a frangible portion  
15 20 which breaks and allows the cap 35 to be removed with the second portion 15 when it is twisted away from the pouring outlet device 25 by a user in an opening operation.

The first sleeve member 5, cap 35 and the pouring outlet device 25 are conveniently assembled to give a  
20 single unit ready for simple application to a bottle neck, thus enhancing the efficiency of the manufacture, bottle filling and assembly process. The valve seat body 42 is held in association with the further sleeve member 30 by resilient rib 91 on the valve seat body 42 co-acting with  
25 inner facing detect means carried within the further sleeve member 30, eg an annular rib - not shown.

Typically, the bottle 3 is made from glass or alternatively a plastics material, the first sleeve member 5 from aluminium, the cap 35 from low density polyethylene,  
30 the further sleeve member 30 from a stiffly resilient plastics material such as polypropylene or polystyrene and which in this embodiment is a polystyrene obtainable under the trade name, Styrolux, the valve member 44 from crystal polystyrene and the valve seat body 42 from low density  
35 polyethylene.

A non-return valve is formed from the valve seat body 42 and valve member 44 which is closed in a normally

upright position of the bottle 3, which while allowing liquids to flow from the bottle 3 in a pouring operation, restricts in-flow of liquid into the bottle 3 by rudimentary unauthorised filling operations or even more  
5 sophisticated methods which may involve insertion of objects, tubes or the like into the bottle mouth 4.

Referring now to Figure 5(a), there is shown a tamper-evident device generally designated 101 according to second embodiment of the present invention. The device 101 is  
10 similar in many respects to the device 1 of the first embodiment, like parts being identified by like numerals but increased by 100.

Device 101 comprises a first sleeve member 105 having a first portion 110 and a second portion 115 associated by  
15 means of frangible portion 120.

Figure 5(b) clearly shows a first beaded portion 130 provided on the first portion 110 and a second beaded portion 135 provided on the second portion 115.

Referring to Figure 6, in the same manner as described  
20 hereinbefore regarding the first embodiment, cap 135 and associated second portion 115 may be removed by twisting away from the pouring outlet device 125 and first portion 110 associated therewith.

Referring to Figure 7(a), cap 35 and second portion 115  
25 are shown reapplied (reclosed) to the pouring outlet device 125 and a gap 140 remains between the first and second portions 110 and 115.

Referring now to Figure 7(b) in the same manner as  
hereinbefore described regarding the first embodiment, edge  
30 150 remains in groove 60 of cap 135 and lip 165 rests upon edge 145 of the first beaded portion 130 of the first portion 110, resulting in void 155 formed between lower edge 185 of cap 135 and the cap seating surface 190.

Referring finally to Figures 8, 9 and 10, there is  
35 illustrated sequential steps in a method of manufacturing a tamper-evident device 201 according to the present invention. The device 201 may be the same as or similar to

the device 1 or the device 101 of the first or second embodiments, like parts being identified by like numerals but increased by 100 or 200, respectively.

The method comprises:

- 5 (a) providing sleeve member 205;
- (b) providing pouring outlet device 225 comprising further sleeve member 230 adapted to be secured to mouth and neck portion of a bottle (not shown), and container closure member 233
- 10 releasably securable to further sleeve member 230 (see Figure 8);
- (c) disposing the pouring outlet device 225 within the sleeve member 205 (see Figure 9); and
- (d) forming substantially circumferential frangible
- 15 portion 220 around sleeve member 205 (see Figure 10).

Further, either before or after step (d), but preferably substantially simultaneously with step (d) the method further comprises:

- 20 (e) forming an annular lip 297 at an open end 298 of the sleeve member 205 so as to entrap the pouring outlet device 225 within the sleeve member 205.

It will be appreciated that other end 299 of the sleeve member 205 is closed.

- 25 The frangible portion 220 and annular tip 297 may be formed using respective blades on a machine tool.

It will be understood that modifications may be made to the embodiment as herein described without departing from the scope of the present invention, for example, the sleeve member 5, 105 may be applied to various different designs of pouring device adapted to be applied to a variety of containers including bottles.

In a modification, for example, the second portion 15,115 and/or the first portion 10,110 may include knurled surfaces to assist in gripping in opening and reopening of

35 the device 1,101.

It will further appreciated that the present invention

provides a particularly desirable one piece snap on fitment have functional advantages over the prior art as well as enhanced aesthetic appeal.

CLAIM

1. A tamper-evident device comprising a first sleeve member which comprises a first portion associated with a second portion by means of a frangible portion  
5 therebetween, and wherein said first portion is adapted to be applied to a mouth and neck portion of a container, and said second portion is associated with a container closure member, and wherein an initial container opening operation causes said frangible portion to fracture or break such  
10 that when the container is reclosed said first and second portions are located in a spaced apart relationship to one another.
2. A tamper-evident device as claimed in claim 1, wherein  
15 the frangible portion is provided adjacent respective circumferential edges of each of the first and second portions.
3. A tamper-evident device as claimed in claim 2, wherein  
20 either or both of the respective circumferential edges retracts or recoils away from the other during an initial container opening operation when the frangible portion fractures or breaks.
- 25 4. A tamper-evident device as claimed in claim 3, wherein the retraction or recoil is accompanied by a concomitant circumferential contraction of at least one of the edges inwardly of the respective first or second portion to provide at least one edge having a smaller circumference  
30 than an adjacent portion of the respective first or second portion.
5. A tamper-evident device as claimed in 4, wherein the retraction or recoil results in a permanent deformation of  
35 the first and/or second portions such that when the container is reclosed the circumferential edges, do not

abut together and thus reveal a void or gap located between the first and second portions, such visual indicator evidencing that the tamper-evident device has been opened.

5 6. A tamper-evident device as claimed in any of claims 1 to 5, wherein the container closure member includes a circumferential groove which provides a circumferential lip portion located below and adjacent to the circumferential groove.

10

7. A tamper-evident device as claimed in claim 6, wherein during an initial container opening operation the first circumferential edge recoils/retracts and circumferentially contracts into the circumferential groove to become  
15 positioned circumferentially behind the circumferential lip.

8. A tamper-evident device as claimed in 7, wherein in use, after initial opening the circumferential lip is  
20 positioned between the first and second circumferential edges in an obstructive manner such that when the container is reclosed by re-applying the closure member, the first and second portions of the sleeve member are spaced apart by the circumferential lip portion located therebetween.

25

9. A tamper-evident device as claimed in any preceding claim, wherein the frangible portion is located in a circumferential groove provided between or adjacent the first and second portions of the sleeve member.

30

10. A tamper-evident device as claimed in claim 9, wherein the frangible portion is located substantially at an apex or base of the groove.

35 11. A tamper-evident device as claimed in any preceding claim, wherein the frangible portion is selected from one of, or a combination of a continuous weakened portion, a

circumferential scored line, or a plurality of intermittent shearable links which join the first portion to the second portion.

5 12. A tamper-evident device as claimed in claim 2 or any of claims 3 to 11 when dependent upon claim 7, wherein the edge of the first portion provides a circumferential first beaded portion on the first portion and the edge of the second portion provides a circumferential beaded portion on  
10 the second portion.

13. A tamper-evident device as claimed in any preceding claim, wherein the sleeve member substantially comprises a metallic based material or metal.

15 14. A tamper-evident device as claimed in claim 13, wherein the metallic based material or metal substantially comprises aluminium.

20 15. A tamper-evident device as claimed in any preceding claim, wherein the container closure member is a cap including a threaded portion allowing a rotational movement of the cap during a container opening operation.

25 16. A tamper-evident device as claimed in any preceding claim, wherein the container is a bottle.

30 17. A tamper-evident device as claimed in any preceding claim, wherein the tamper-evident device include a pouring outlet device adapted to be secured to the mouth of the container for liquid, and wherein the container closure member is a cap adapted to close the outlet of the pouring outlet device and wherein the sleeve member is adapted to receive at least part of the pouring outlet device.

35 18. A tamper-evident device as claimed in claim 17, wherein the second portion of the sleeve member is adapted to receive at least part of the cap.

19. A tamper-evident device as claimed in claim 18, wherein the cap is received in a tight interference fit to the second portion, but is optionally rotatable with respect to the second portion of the sleeve member upon application of sufficient force.

20. A tamper-evident device as claimed in any of claims 17 to 19, wherein the pouring outlet device is desirably a non-refillable and/or a non-removable device.

21. A tamper-evident device as claimed in any of claims 17 to 20, wherein the pouring device comprises a further sleeve member which is adapted to lie around the mouth and neck portion of the container and further comprises a valve seat body which is at least partially receivable within at least part of the neck portion of the container, and wherein the valve seat body is at least partially surrounded by the further sleeve member.

20

22. A tamper-evident device as claimed in any of claims 17 to 21, wherein the sleeve member is adapted to receive at least part of the further sleeve member, in a tight interference fit but optionally rotatable with respect to the further sleeve member upon application of sufficient force.

23. A tamper-evident device as claimed in claim 6 or any of claims 7 to 22 when dependent thereon, wherein the circumferential groove of the sleeve member is located within a circumferential groove provided on the cap.

24. A tamper-evident device as claimed in claim 23 when dependent upon claim 15, wherein in use, the container is initially opened by twisting the cap, and the edge of the second portion of the sleeve member remains within the groove provided on the cap, and the edge of the first

portion of the sleeve member progressively moves out of the groove provided on the cap as the cap is removed away from the pouring outlet device and the first portion, and on removing the contact between the cap and the first portion  
5 of the first sleeve member, the first edge retracts to cause a contraction of circumference such that the resulting circumference is less than that of a cap portion which is located below the groove therein.

10 25. A tamper-evident device as claimed in claim 24, wherein the cap portion is provided as a circumferential lip on the cap.

26. A tamper-evident device as claimed in claims 24 or  
15 25, wherein when the cap is re-applied to the pouring outlet device, a stop position is reached when the circumferential lip of the cap rests or sits upon the edge of the first portion of the sleeve member, thus preventing the cap being returned to its original position, and such  
20 that a gap or void remains between the first and second portions of the sleeve member thus exposing the circumferential portion of the cap, which includes the circumferential lip which was originally enclosed within the first sleeve member.

25 27. A tamper-evident device as claimed in claim 26, wherein a further gap exists between the lower edge of the cap and a cap seating surface of the pouring device.

30 28. A tamper-evident device as claimed in claims 26 or 27, wherein the exposed circumferential portion of the cap is distinctly coloured and/or printed with information, promotional messages or the like.

35 29. A container including a tamper-evident device as claimed in any of claims 1 to 28.

30. A container as claimed in claim 29, wherein the container is a glass bottle for containment of an alcoholic drink.

5 31. A combination of a container and a tamper-evident device according to any of claims 1 to 29.

32. An alcoholic drinks product comprising an alcoholic substance packaged in the combination of claim 31.

10

33. A method of manufacturing a tamper-evident device comprising the steps of:

- (a) providing a sleeve member:
- 15 (b) providing a pouring outlet device comprising a further sleeve member adapted to be secured to a mouth or neck portion of a container for liquid, and a container closure member releasably securable to the further sleeve member;
- 20 (c) disposing the pouring outlet device at least partly within the sleeve member; and
- (d) forming a substantially circumferential frangible portion around the sleeve member.

25 34. A method of manufacturing a tamper-evident device as claimed in claim 33, wherein the method includes the further step of securing the sleeve member and pouring outlet device one to the other by forming a lip on an open end of the sleeve member so as to entrap the pouring outlet  
30 device within the sleeve member.

35 35. A tamper-evident device comprising a first body part associated with a second body part by means of a frangible portion therebetween, and wherein said first body part is adapted to be applied to a mouth and neck portion of a container, and said second body part provides a container closure member, and wherein an initial container opening

operation causes said frangible portion to break, and wherein further when the device is reclosed at least part of the first body part originally adjacent the frangible portion, and at least part of the second body portion  
5 originally adjacent the frangible portion are spaced apart from one another so as to provide a visual indication of reclosure.

36. A tamper-evident device as claimed in claim 35,  
10 wherein the first body part includes means for non releasable and substantially immovably fixing the first body part to a mouth or neck portion of a container.

1/8

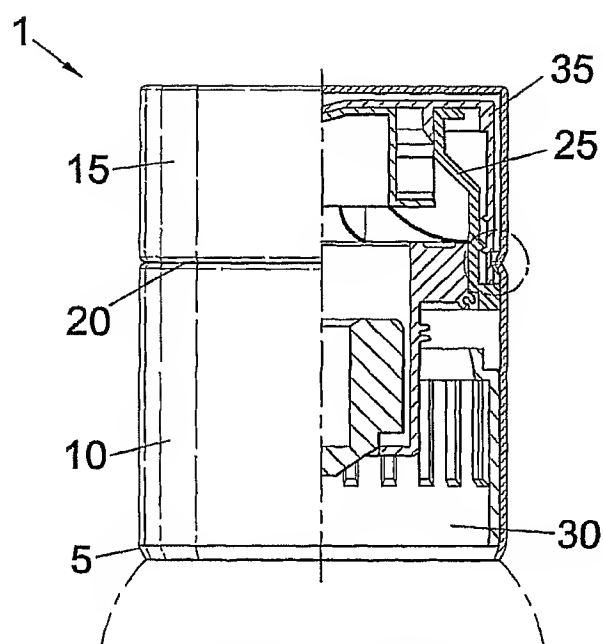


Fig. 1(a)

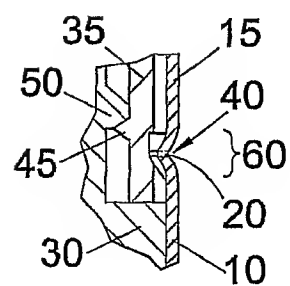


Fig. 1(b)

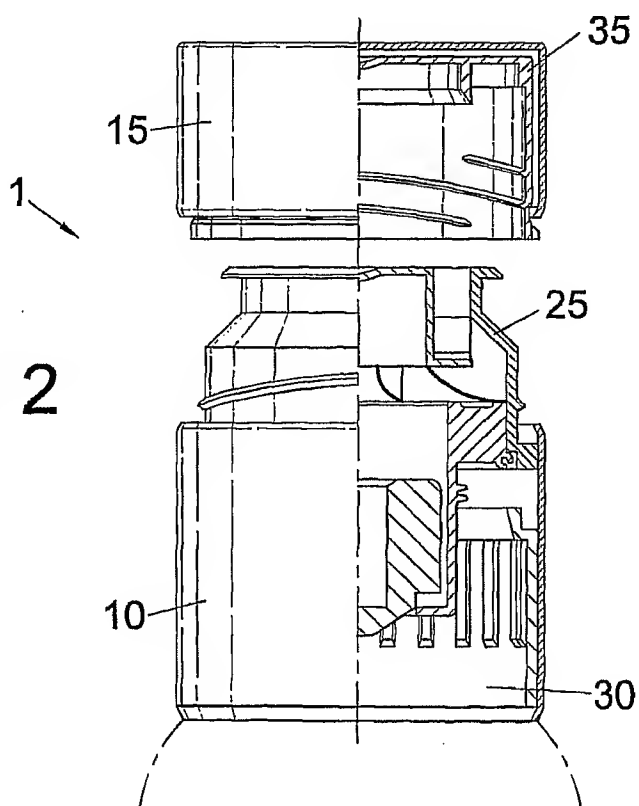


Fig. 2

2/8

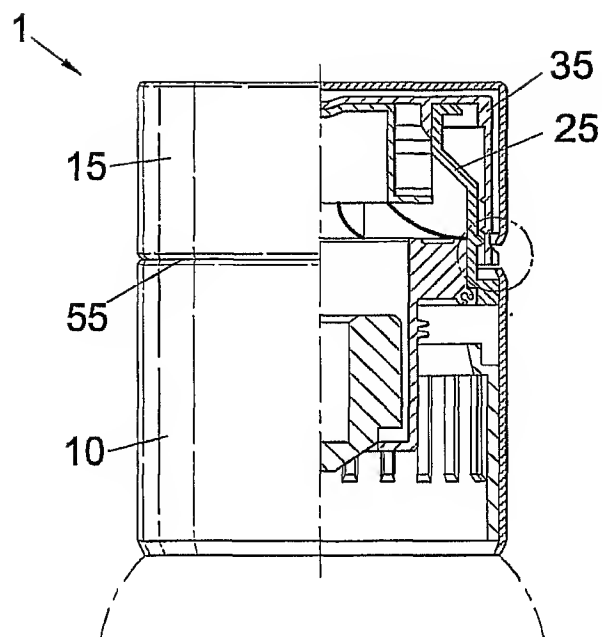


Fig. 3(a)

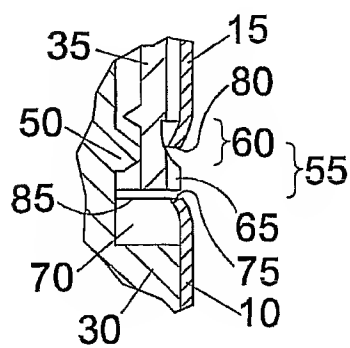


Fig. 3(b)

3/8

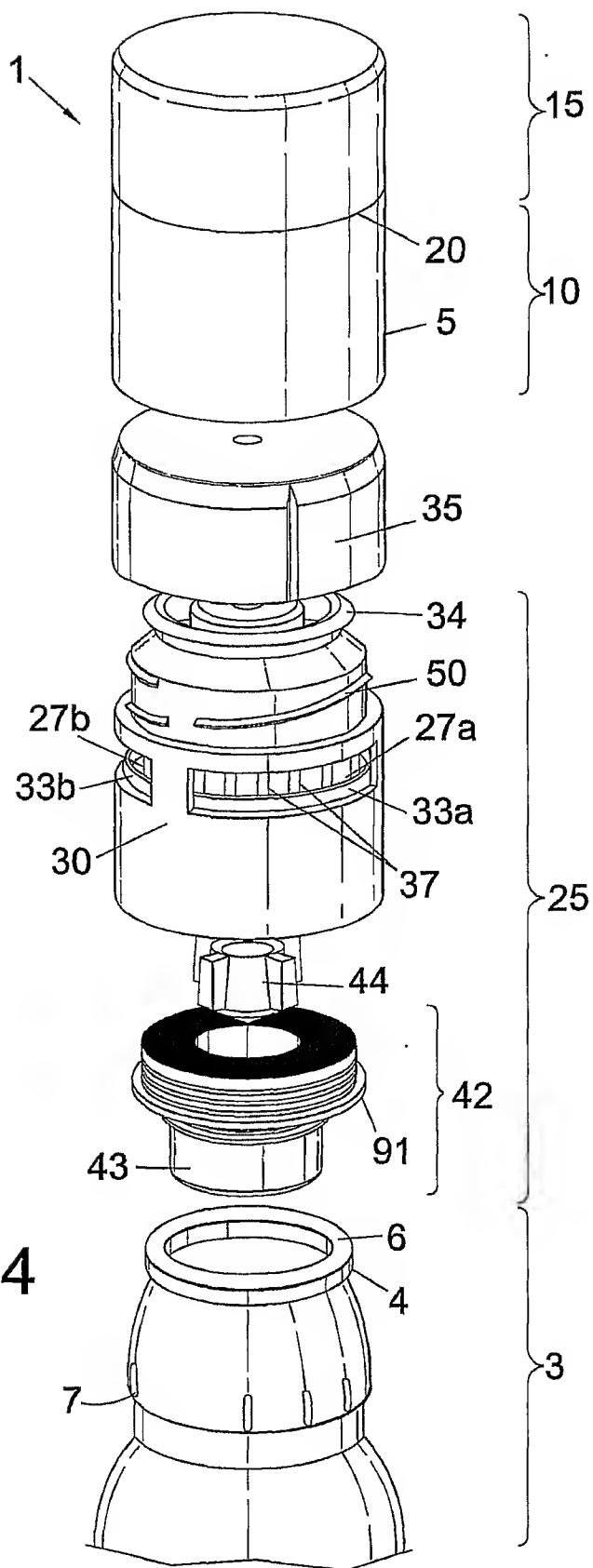


Fig. 4

4/8

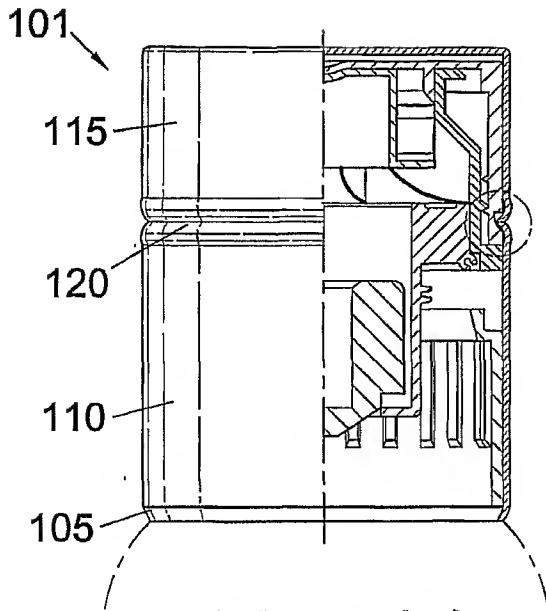


Fig. 5(a)

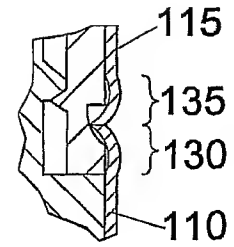


Fig. 5(b)

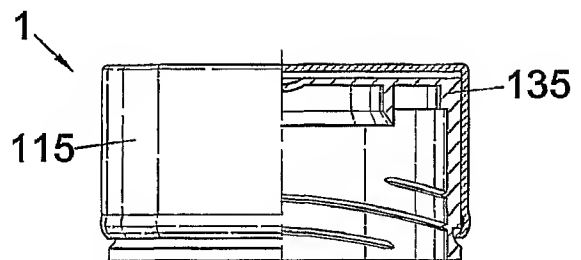
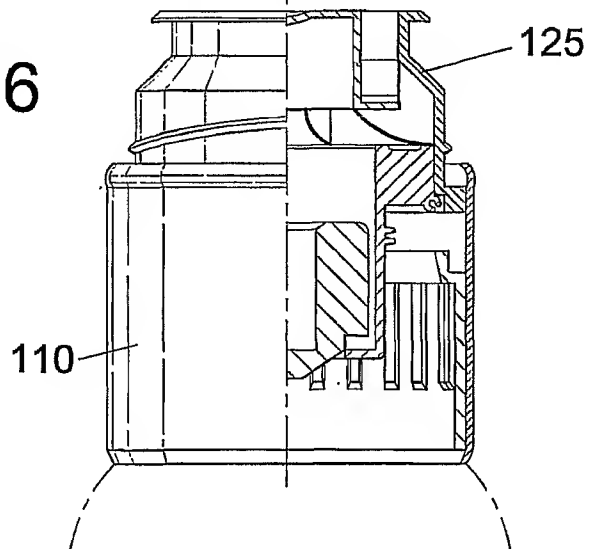


Fig. 6



5/8

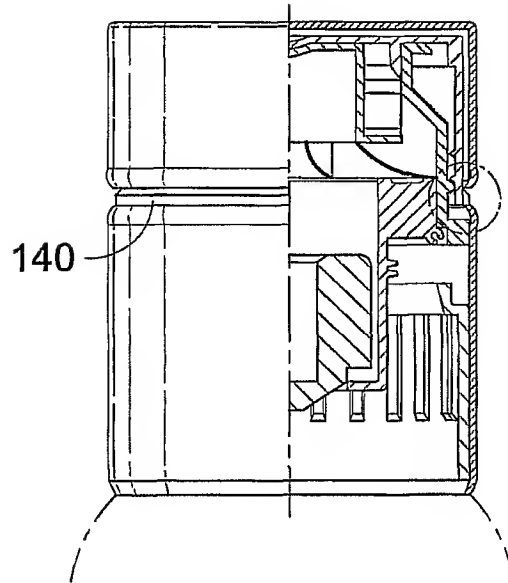


Fig. 7a

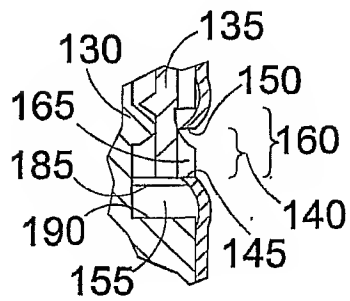


Fig. 7b

6/8

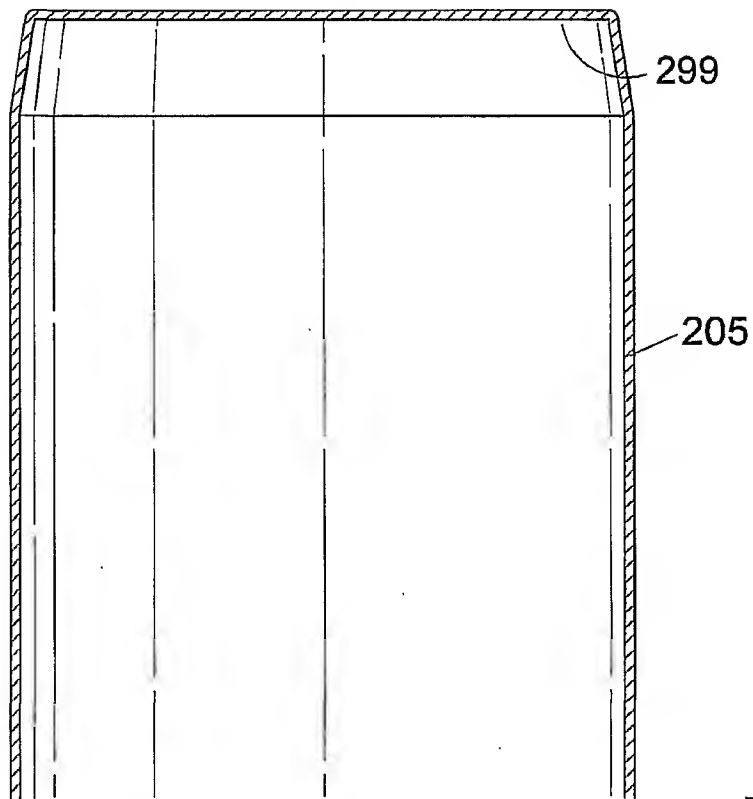
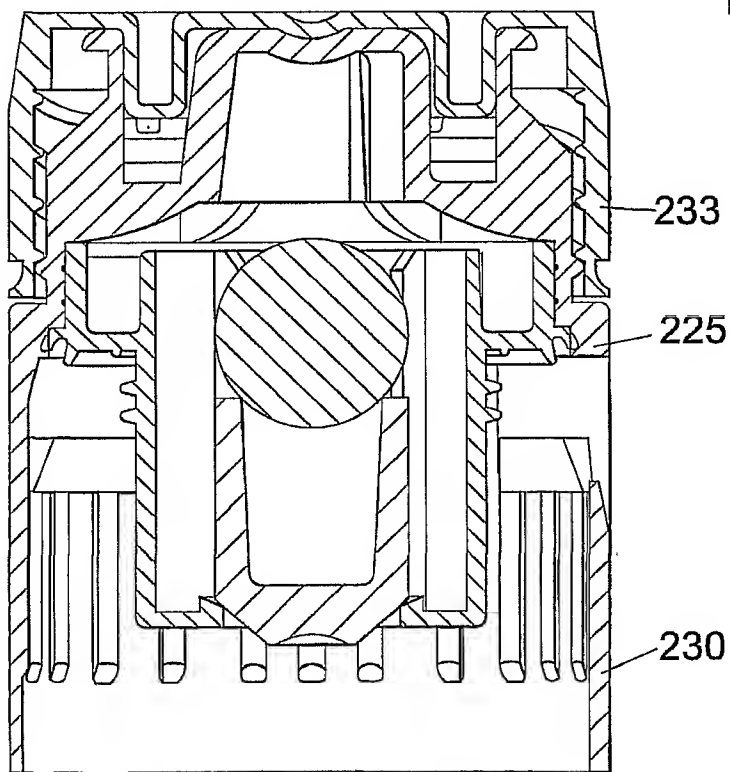


Fig. 8



7/8

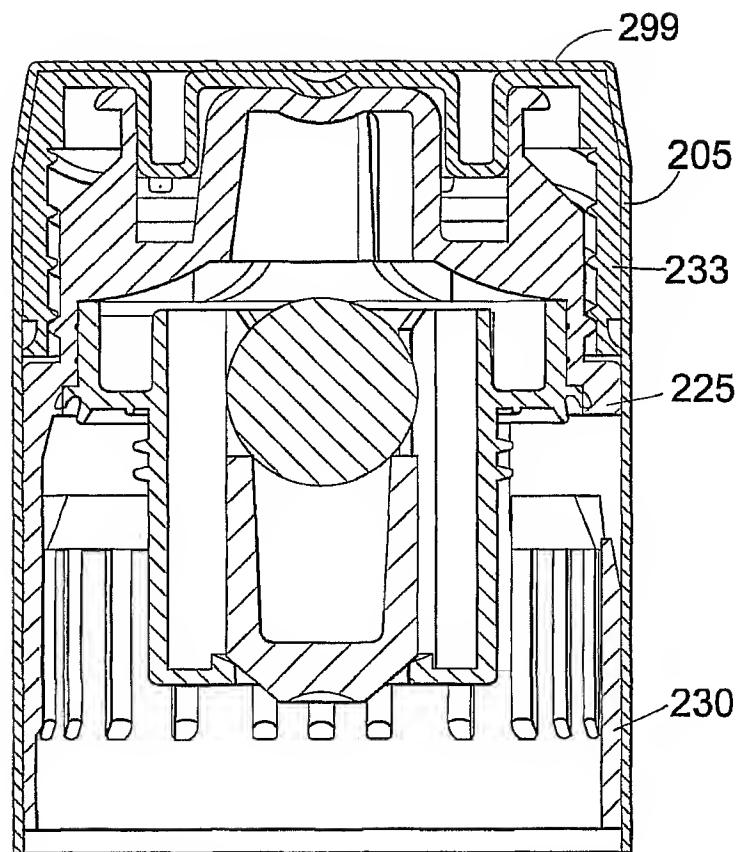


Fig. 9

8/8

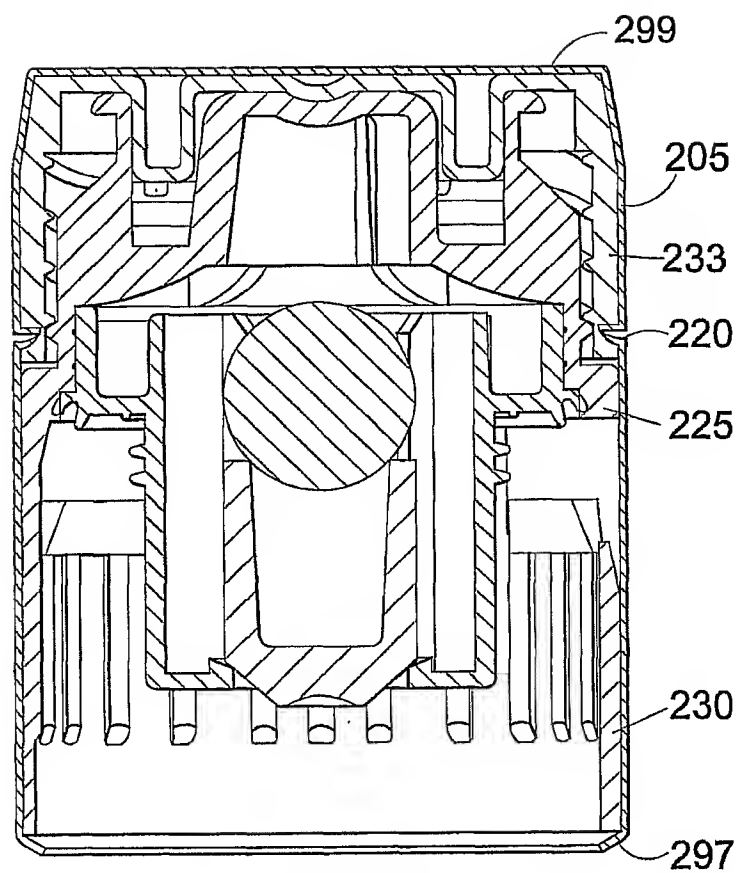


Fig. 10

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/02404

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65D49/04 B65D55/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 847 930 A (ALUCAPVIT SPA) 17 June 1998 (1998-06-17)  column 4, line 31-55 figure 2	1,2,11, 13,16, 29,31, 35,36
Y	column 3, line 12-17	9,10, 20-22
X	US 4 000 824 A (HAN HAK RHIM) 4 January 1977 (1977-01-04)  column 1, line 21-30 column 2, line 26-52 figures 2,3	1,2,11, 16, 29-32,35



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'E' earlier document but published on or after the international filing date
- 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- 'O' document referring to an oral disclosure, use, exhibition or other means
- 'P' document published prior to the international filing date but later than the priority date claimed

- 'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- 'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- 'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- '&' document member of the same patent family

Date of the actual completion of the international search

12 September 2002

Date of mailing of the international search report

18/09/2002

Name and mailing address of the ISA

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Authorized officer

Kakoullis, M

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 02/02404

## G.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 262 743 A (LE BOUCHAGE MECHANIQUE) 2 February 1972 (1972-02-02) page 2, line 18-27	33, 35, 36
A	page 1, line 10-16  page 2, line 42-51 page 2, line 106-113	1, 2, 11-14, 16, 20
X	EP 0 627 359 A (JUNQUERAS GUERRE JOAQUIN) 7 December 1994 (1994-12-07) column 3, line 54 -column 4, line 36	33, 35, 36
Y	figure 2	9, 10, 20-22
A	---	1, 2, 11, 16, 17
A	WO 00 75033 A (STETA GUILLERMO H ;CATALA ESTEBAN (MX); PLASTICOS DUMEX S A DE C V) 14 December 2000 (2000-12-14) abstract	21, 22
P, X	GB 2 366 287 A (MONTGOMERY DANIEL & SON LTD) 6 March 2002 (2002-03-06)  page 10, line 22 -page 11, line 9 page 16, line 10 -page 17, line 24 figures 4, 5	1, 2, 11, 13-22, 29, 31, 33, 35, 36

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 02/02404

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-36

1.1. Claims: 1-32, 35, 36

Tamper-evident sleeve comprising first and second portions which are spaced apart after initial opening

1.2. Claims: 33, 34

Method of manufacturing a tamper-evident device not limited to sleeves having portions which are spaced apart after initial opening

2. Claims: 37-40

xxx

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 02/02404

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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(19) World Intellectual Property  
Organization  
International Bureau



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2 June 2005 (02.06.2005)

PCT

(10) International Publication Number  
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50/04, 51/18, 41/04

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(22) International Filing Date: 26 October 2004 (26.10.2004)

(25) Filing Language: English

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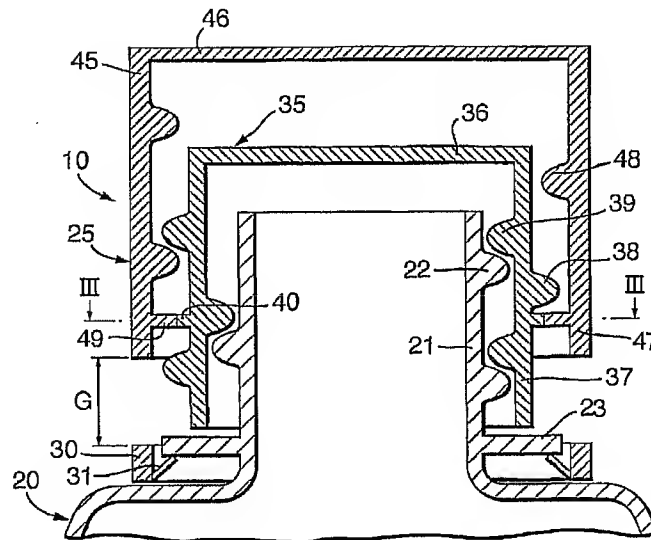
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[Continued on next page]

(54) Title: A TAMPER-EVIDENT CLOSURE



(57) Abstract: A tamper-evident closure (10) for a container (20) is provided. The closure (10) comprises a first portion (25) including inner (35) and outer (45) parts, and a second portion (30). The outer part (45) is movable relative to the inner part (35) from a first position in which the outer part (45) is immediately adjacent the second portion (30) to a second position in which there is an empty, unobstructed gap (G) therebetween. The inner (35) and outer (45) parts are adapted to become irreversibly locked in the second position so that the outer part (45) cannot be moved back to the first position to close the gap (G). A combination of such a closure (110) with an in-bore filament (100) connectable to a container (120) is also provided.

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A TAMPER-EVIDENT CLOSURE

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The present invention relates generally to a closure for a container and particularly to a closure with means for indicating that the closure has been opened at least once.

5        There is an increasing demand for tamper-indicating systems which ensure that a container is not re-filled with non-original contents. Whilst it is relatively easy to produce some form of tamper-evidence, it is much more difficult to provide tamper-evidence which cannot be  
10 either overcome without causing the tamper-evidence system to activate, or activated and then returned to a visually identical state so as to appear non-activated.

A particularly useful method of providing tamper-evidence is to use a system in which a closure is  
15 initially located in a first position, but once removed can only be returned to a second position which is visually distinct from the first position. For example, US 5,738,231 describes a closure with a part which is moved during the opening process so that following  
20 opening it cannot pass back over a projection on the container finish. The result is that the closure can only return to a position in which it is axially displaced with respect to its original position. Document WO 02/096771 describes a closure with a first  
25 portion with inner and outer parts, and a second portion. Initially a section of the inner part of the first portion protrudes below the level of the outer part and is held firmly by a region of the second portion which is formed so as to have a reduced circumference. When the

first portion is removed the section of the inner part is pulled from under the area of reduced circumference on the second portion. After removal the inner part of the first portion and the area of reduced circumference on the second portion retain their original dimensions, so that if the first portion is reapplied the inner part can no longer pass under the area of reduced circumference. Accordingly a gap is produced between the outer part of the first portion and the second portion, because the section of the inner part which was previously trapped under the second portion is now trapped above the area of reduced circumference.

In both of the above prior art documents a gap is formed by trapping an obstructing member. The problem with such systems is that the obstruction member is easily accessible and could be removed, for example by cutting to defeat the tamper-evidence.

The present invention seeks to address the above problem.

The present invention provides a tamper-evident closure for a container, the closure comprising a first portion including inner and outer parts and a second portion, the outer part is movable relative to the inner part from a first position in which the outer part is immediately adjacent the second portion to a second position in which there is an unobstructed gap therebetween, the inner and outer parts are adapted to become irreversibly locked in the second position so that the outer part cannot be moved back to the first position to close the gap.

The present invention therefore does not rely on an obstructing member becoming trapped to form a gap therebetween. By forming an unobstructed gap it is not possible to defeat the tamper-evidence by a simple cutting operation.

The second portion may be connected to a container and the first portion may comprise a cap. Certain industries demand closures with a first portion comprising a cap and a second portion comprising a sleeve which is connected to a container; for example the spirits industry.

The second portion may be permanently fixed in its position on the container. This prevents the second portion from being moved upwardly to close the gap.

The first portion may be adapted to engage an in-bore fitment associated with the container. Certain industries, in particular the spirits industry, demand additional measures to prevent tampering. In-bore fitments such as non-return fitments are often fitted to containers to prevent re-filling regardless of other tamper-evidence measures.

The first portion may include a ratchet arrangement for locking the inner and outer parts in the second position. A ratchet arrangement is a simple and efficient method of irreversibly locking the inner and outer parts together.

The first portion may include formations, such as screw threads, for engaging the container or in-bore fitment as appropriate. In such cases the ratchet arrangement or other locking mechanism may be located

above the formations so as to increase the difficulty in accessing and tampering with the locking arrangement.

The gap formed in the closure may be at the respective adjacent peripheries of the portions. By  
5 forming the gap at the peripheries the gap is more visually obvious.

The inner part may include a part which extends beyond the outer part towards the second portion in the second position. Whilst the part is in no way an  
10 obstruction member and is in no way required for formation of the unobstructed gap, the part is visible through the gap. The part could be, for example, a brightly coloured band to accentuate the presence of the gap.

15 The present invention also provides, in combination a container and a tamper-evident closure, the closure comprising a first portion including inner and outer parts, and a second portion, the second portion is connected to the container and the first portion is the  
20 removable top cap, the first portion outer part is movable relative to the inner part from a first position in which the outer part is immediately adjacent to the second portion to a second position in which there is an empty, unobstructed gap therebetween. Thereafter the  
25 first portion is removable and the inner and outer parts are adapted to become irreversibly locked in the second position so that the outer part cannot be moved back to the first position to close the gap when the first portion is replaced.

The combination may further comprise an in-bore fitment connectable to the container, the first portion being adapted to engage the fitment.

The present invention will now be more particularly described, by way of example, with reference to the following drawings, in which:

Fig 1 is a section of a closure according to a first embodiment of the present invention, shown attached to a container and being in a first position;

10 Fig 2 shows the closure of Fig 1 in a second position prior to removal from the container;

Fig 3 shows a diagrammatic section along line III-III of Fig 2 illustrating a ratchet arrangement for locking the closure in the second position;

15 Fig 4 shows the closure of Fig 3 following removal from the container;

Fig 5 shows the closure of Fig 4 following re-attachment to the container following first opening;

20 Fig 6 is a section of a tamper-evident closure according to an alternative embodiment, shown forming part of a tamper-evident arrangement on a container neck and being in a first position;

Fig 7 is a perspective view of a shell forming part of the closure of Fig 6;

25 Fig 8 is a perspective view of a ratchet member forming part of the closure of Fig 6;

Fig 9 is a perspective view of a liner part forming part of the closure of Fig 6;

30 Fig 10 is a perspective view of a pouring part forming part of the non-return fitment of Fig 6;

Fig 11 is a perspective section of a basket part forming part of the non-return fitment of Fig 6;

Fig 12 is a perspective view of a float forming part of the non-return fitment of Fig 6;

5 Fig 13 is a perspective view of the neck finish of Fig 6; and

Fig 14 is section of the closure of Fig 6 with the closure shown in a second position.

Referring to Fig 1 there is shown a tamper-evident  
10 closure generally indicated 10 attached to a container generally indicated 20. The container 20 includes a neck portion 21 with external screw threads 22. At the lower end of the neck 21 is an annular retention ring 23, the purpose of which is described in more detail below.

15 The closure comprises a first portion 25 and a second portion 30. The first portion 25 includes inner 35 and outer 45 parts.

The inner part 35 comprises a disk-shape top plate 36 with a cylindrical skirt 37 depending from its  
20 periphery.

The outer surface of the skirt 37 has screw threads 38 for engaging corresponding threads on the outer part 45.

The inner surface of the skirt 37 has screw threads  
25 39 for engaging corresponding threads 22 on the container 20.

Approximately half way along its length, the outer surface of the skirt 37 also includes two diametrically opposed wedge-shape ratchet members 40 (best shown in Fig  
30 3).

The outer part 45 comprises a disk-shape top plate 46 with a cylindrical skirt 47 depending from its periphery.

The inner surface of the skirt 47 has screw threads 48 for engaging the threads 38 on the inner part 35.

At its open end, the inner surface of the skirt also includes two dimensionally opposed, wedge-shape ratchet members 49 (best shown in Fig 3).

The second portion 30 comprises an annular tamper-evident band and is connected to the open end of the outer part skirt 47 by frangible bridges 48. At the other end of the second portion 30, a plurality of flaps 31 project radially inwardly and upwardly. The flaps 31 are positioned to engage beneath the annular retention ring 23 on the container 20.

The operation of the closure will now be described with reference to Figs 2 to 5.

In order to open the closure 10 the outer part 45 is grasped and turned. The tightness of fit between the inner part 35 and the neck portion 21 is designed to be greater than that between the inner part 35 and the outer part 45, which means that there is greater friction. Accordingly when the outer part 45 is initially turned it is the outer part 45 which moves axially upwards relative to the inner part 35; the inner part remains stationary.

As the outer part 45 moves upwards the flaps 31 prevent the second portion 30 from moving by virtue of their engagement under the retention ring 23. As a result the frangible bridges 48 break and the second portion 30 remains in position.

Continued turning of the outer part 45 eventually leads to the ratchet members 40, 49 passing each other and locking in the position shown in Figs 2 and 3. The outer and inner parts 45, 35 are now irreversibly locked  
5 in this second position. It will be seen that there now exists a gap (G) between the open end of the outer part skirt 47 and the second portion 30. The gap (G) is empty and unobstructed; that is, the gap (G) is not created by an obstruction structure which braces between the skirt  
10 47 and the second portion 30.

With the outer 45 and inner 35 parts locked together as shown in Figs 2, continued turning of the outer part 45 now acts to unscrew the inner part 35 from the container neck 21. In Fig 4 the closure 10 is shown  
15 removed completely from the container neck 21 to allow access to the container 20.

When the closure 10 is replaced on the container neck 21 it cannot be returned to its first position because the inner and outer parts 35, 45 are still locked  
20 together. Instead the closure can only be returned to the position shown in Fig 5, in which the gap (G) remains.

In this embodiment it will be noted that the length of the inner part skirt 37 is such that it protrudes  
25 below the level of the outer part skirt 47 in the second position. As a result, the skirt 37 can be seen through the gap (G). The skirt 37 could, for example, be brightly coloured or include a message in the area visible through the gap (G) to accentuate the fact that  
30 the gap (G) is there and warn of potential tampering.

Figs 6 to 13 show an alternative embodiment of the present invention. In this embodiment the closure 110 forms part of a tamper-evident arrangement for a container 120 having a neck 121 with an associated in-bore non-return fitment generally indicated 100.

Referring generally to Fig 6, the components of the tamper-evident arrangement are as follows: the closure 110 comprises a shell 155, a ratchet part 160 and a liner part 165; the non-return fitment 100 comprises a pouring part 175, a ball 200, a float valve 186 and a basket part 190.

The components of the tamper-evident arrangement will now be described in more detail.

The closure shell 155 is shown in Fig 7 and is a metal closure of the well-known "roll-on pilfer-proof" type. The shell comprises a disk-shape top plate 156 with a side wall 157 depending from its periphery. The shell 155 includes upper 155a and lower 155b sections. The shape of the side wall 157 is determined at least in part after the shell is applied because a series of rollers and cutters are used to form a frangible line 159 and first 158a and second 158b rolled-in regions, as is described in more detail below.

The ratchet part 160 is shown in Fig 8 and comprises a tubular body part. The inner surface of the part 160 includes screw threads 161. The inner surface also includes a ratchet member 162 for engaging a corresponding notch in the liner part 165. The inner surface also includes a ratchet step 163 formed by a band of thicker material at the opposite end of the part 160

to the ratchet member 162. The outer surface includes an annular groove 164 which is used to hold the part 160 in the shell 155 by virtue of a first crimped-in region 158 of the shell 155 (see Fig 6).

5       The liner part 165 is shown in Fig 9 and comprises a disk-shape top plate 166 with a cylindrical skirt 167 depending from its periphery. The upper part 167a of the surface of the skirt 167 includes screw threads 168 for engaging the threads 161 of the ratchet part. The inner  
10       surface of the skirt 167 includes screw threads 169 (shown in phantom on Fig 9) for engaging corresponding threads on the pouring part 175. Below the thread start of the external screw thread 168 is a notch 174 for receiving the ratchet member 162 of the ratchet part 160.  
15       Below the thread start of the internal screw thread 169 is a ratchet tooth 174a (see Fig 6) for engaging a corresponding tooth 180a on the outer surface of the pouring part 175 (see Fig 6).

      The top plate 166 is surrounded by an annular  
20       upturned flap 170. The skirt 167 includes an annular extension portion 171 below an annular flange 172 at the lower end of the skirt 167.

      As shown best in Fig 6, an annular plug band 173 depends from the inner surface of the top plate 166 and  
25       is adapted to engage in the pouring part 175.

      The pouring part 175 is shown in Fig 10 and comprises a generally frusto-conical hollow body with an upper thread-bearing portion 176 having external screw threads 177 for engaging the internal screw threads 169  
30       on the liner 165. Within the thread bearing portion 176

is positioned a dome-shape flow regulator 178. The regulator 178 is attached by three axial spokes 179 to the inner wall of the portion 176 to provide a flow path around the regulator 178.

5        A ball chamber 180 depends from the portion 176 and is sized to accommodate the ball 200 in such a way that it can move freely. The outer surface of the ball chamber 180 includes the ratchet tooth 180a for engaging the ratchet tooth 174a of the liner part 165,

10       A basket-retaining part 181 depends from the ball chamber 180. The internal bore of the basket-retaining part 181 is increased by a step 182 at the bottom of the ball chamber 180. The increased bore is sized to accommodate the basket 190 as described below.

15       A neck-engaging part 183 depends from the basket retaining part 181. The neck-engaging part 183 begins with an external annular groove 184a which is used to help hold the fitment 175 on the container neck 121 by virtue of the second rolled-in region 158b of the shell  
20       (see Fig 6).

Below the groove 184a, the internal surface of the part 183 includes a plurality of axial ribs 185 for engaging ribs 125 on the container neck 121, as described below. The ribs 185 are visible in Fig 10 through a  
25       window 186 in the basket-retaining part. An identical window is present diametrically opposite (not shown). The windows 186 are present so that a sharp retention edge 184c can be formed in a moulding production process. The edge 184c provides a very strong connection under the  
30       lip 123 of the container neck 121.

Opposite the external groove 184a is an internal step 184b.

The basket part 190 is shown in Fig 11 and includes an annular upper part 191 sized so that it has an interference sealing fit within the basket-retaining part 181 of the pouring part 175. The seal is improved with the presence of a bead 192 approximately half way along the outer surface of the part 191. The internal diameter of the part 190 decreases at the lower end of the upper part 191 with a curved step 193 and continues to form an annular plug part 194 sized to fit sealingly into the internal bore of the container neck 121. Approximately half way along the external surface of the plug part 194 is a bead 195 for improving the seal against the container neck 121.

At the intersection of the step 193 and the plug part 192 a valve seat comprising a circular groove 194 extends radially inwardly and connects to a non-return valve comprising an upstanding hoop 195 with the three internal spokes 196 forming three generally triangular orifices 197. At the bottom of the annular upper part 191 an inwardly curved sealing member 198 depends. The sealing member 198 can flex upwardly towards the underside of the step 193 and is positioned to seal against the upper surface 122 of the container neck.

Also at the bottom of the annular upper part 191 a circumferential flange 199 extends radially outwards.

The float valve 186 is shown in Fig 12 and comprises a disk-shape top plate 187 with a cylindrical skirt 188 depending from its periphery. The skirt 188 is sized so

that its open end fits into the groove 194 of the basket part 190.

The neck finish 121 is shown in Fig 13 and comprises an upper lip 123 below which is a lower portion 124 of reduced diameter. The lower portion has a plurality of spaced axial ribs 125 around its periphery. A shoulder emerges from the lower end of the lower portion 124.

The tamper-evident arrangement shown in Fig 6 is assembled as follows.

10 The ball 200 is placed in the ball chamber 182. The float 186 is placed on the basket 190 and sits in the groove 194. The upper part 191 of the basket is pushed into the basket-retaining part 181 of the pouring part 175; the insertion extent is limited by the step 182.

15 The liner part 165 is screwed onto the pouring part 175 using the corresponding screw threads 169, 177. The plug part 173 enters the inner bore of the thread bearing portion 176. The ratchet part 160 is connected to the pouring part by opening the tubular body part at the split line 160a. The part 160 is then fitted around the upper part 167a of the pouring part before allowing the part 160 to close with the threads 161, 168 now engaged and the lower edge of the ratchet resting on the liner flange 172.

25 The ratchet part 160, liner part 165, pouring part 175, ball 200, float valve 186 and basket part 190 are then added to the container neck 121 by pressing the neck-engaging part 183 of the pouring part 175 over the lip 123. The plug part 192 of the basket 190 enters the inner bore of the container neck 121 until the sealing

30

member 198 contacts the upper surface 122 of the container neck 121 and the step 184b clips under the lip 123. At this point the ribs 125, 185 on the neck 121 and pouring part 175 engage to prevent relative rotation.

5           The shell 155 is now added. The shell side wall 157b is initially straight. Following placement over the rest of the tamper-evident arrangement the side wall is crimped into the groove 164 of the ratchet part and the groove 184 of the pouring part at points 158a and 158b  
10           respectively.

          A frangible line 159 is created approximately half way down the side wall 157 by slitting to leave thin bridges (not shown).

          The operation of the closure is as follows.

15           Initially the upper section 155a of the shell 155 is grasped above the frangible line 159 and twisted. The pouring part 175 cannot turn by virtue of the ribs 125, 185 on the container neck 121 and the neck-engaging part 183. The lower section 155b of the section of shell  
20           below the frangible line is firmly connected to the pouring part by crimped-in region 158b, and also cannot turn. The liner part 165 is prevented from turning relative to the pouring part 175 at this stage because of the interaction of the ratchet teeth 174a, 180a.

25           The upper section 155a of the shell turns and the frangible line 159 breaks. The turning of the upper section 155a turns the ratchet part 160 by virtue of the firm connection provided by the region 158a in the groove 164.

The ratchet part 160 continues to rise in the upper shell section 155a until the step 163 passes over the flap 170 and the ratchet member 162 enters the notch 174 on the liner part 165. The flap 170 prevents the upper-  
5 shell section 155a from moving back down by its engagement with the step 163 and the ratchet member 162 prevents relative rotation between the ratchet part 160 and the liner part 165. Because the step 163 and flap 170 are located above the respective screw threads,  
10 access to this part of the closure is made difficult. Re-setting of the ratchet arrangement is thereby made more difficult.

The tamper-evident arrangement is now shown in the position shown in Fig 14. A gap (G1) is formed in the  
15 shell 155 between the upper 155a and lower 155b shell sections. The gap (G1) is unobstructed; there is no obstacle at the point of dislocation to prevent closing of the gap (G1). Continued turning of the upper shell section 155a now turns the liner 165 with respect to the  
20 pouring part 175; again the pouring part 175 remains stationary.

The action of twisting the liner part 165 off the pouring part 175 may break one or both of the ratchet teeth 174a, 180a, and may make a 'crack' sound to  
25 reinforce the tamper-proof nature of the closure. Therefore the interaction of the ratchet teeth 174a, 180a must be strong enough to counter the force of the ratchet part 160 turning relative to the liner part 165. In particular the interaction must be strong enough to  
30 remain intact as the ratchet part step 163 passes over

the liner flap 170. However, the ratchet teeth 174a, 180a interaction is such that it can be overcome once the ratchet part 160 and liner part 165 are locked in place. Other types of semi-permanent locking arrangements could be used between the liner part 165 and the pouring part 175. For example the parts could be glued together. Preferably the locking arrangement is destroyed during the opening operation to prevent the tamper-evident arrangement from being re-set.

10       The non-return fitment 100, of which the pouring part 175 forms part, will be well known to those skilled in the art and its operation will not be described in detail.

15       The upper shell section 155a, the ratchet part 160 and the liner part 165 are then removed to expose the pouring part 175.

20       When the upper shell section 155a is replaced and the liner part 165 is screwed back onto the pouring part 175, the gap (G1) cannot be re-closed because the ratchet part 160 prevents the upper shell section 155a moving down further than is shown in Fig 14. It will be noted that the annular extension portion 171 of the liner 165 is visible through gap (G1) in the position shown in Fig 14.

25       The upper shell section 155a constitutes the first portion outer part of the closure. The liner 165 constitutes the first portion inner part. The lower shell section 155b constitutes the second portion. The ratchet part 160 locks the inner and outer parts together.

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**CLAIMS:**

1. A tamper-evident closure (10) for a container (20), the closure comprising:
  - a first portion (25) including inner (35) and outer (45) parts, and
  - a second portion (30),the outer part (45) is movable relative to the inner part (35) from a first position in which the outer part (45) is immediately adjacent the second portion (30) to a second position in which there is an unobstructed gap (G) therebetween, the inner (35) and outer (45) parts are adapted to become irreversibly locked in the second position so that the outer part (45) cannot be moved back to the first position to close the gap (G).
2. A closure (10) according to claim 1, wherein the second portion (30) is adapted to be connected to a container (20) and the first portion (25) comprises a cap.
3. A closure (10) according to claim 2, wherein the second portion (30) is permanently fixed in its position on the container.
4. A closure (110) according to any of claims 1 to 3, wherein the first portion (155a, 165) is adapted to engage an in-bore fitment (100) associated with the container.

5. A closure (10) according to any preceding claim, wherein the first portion (25) includes a ratchet arrangement (40, 49) for locking the inner (35) and outer parts (45) in the second position.

6. A closure (110) according to claim 5, wherein the first portion (155a, 165) includes engagement formations (169) and the ratchet arrangement (163, 170) is located above the formations (169).

7. A closure (10) according to any preceding claim, wherein the gap (G) is formed at the respective adjacent peripheries of the portions (25, 30).

8. A closure (110) according to any preceding claim, wherein the inner part (165) includes a part (171) which extends beyond the outer part (155a) towards the second portion (155b) in the second position, the part (171) is positioned so as to be visible through the gap (G1).

9. In combination a container (20) and a tamper-evident closure (10), the closure (10) comprising:

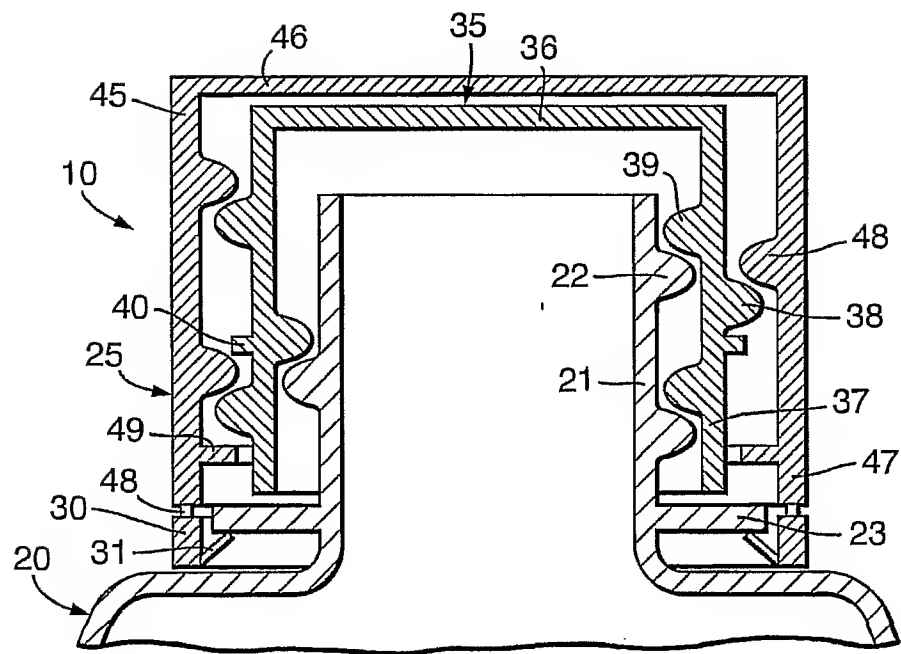
- a first portion (25) including inner (35) and outer (45) parts, and
- a second portion (30),

the second portion (30) is connected to the container (20) and the first portion (25) is a removable top cap, the first portion outer part (45) is movable relative to the inner part (35) from a first position in which the outer part (45) is immediately adjacent the

second portion (30) to a second position in which there is an empty, unobstructed gap (G) therebetween, thereafter the first portion (25) is removable and the inner (35) and outer (45) parts are adapted to become irreversibly locked in the second position so that the outer part (45) cannot be moved back to the first position to close the gap (G) when the first portion (25) is replaced.

10. A combination according to claim 9, wherein the combination further comprises an in-bore fitment (100) connectable to the container (120), the first portion (155a, 165) being adapted to engage the fitment (100).

Fig.1.



2/10

Fig.2.

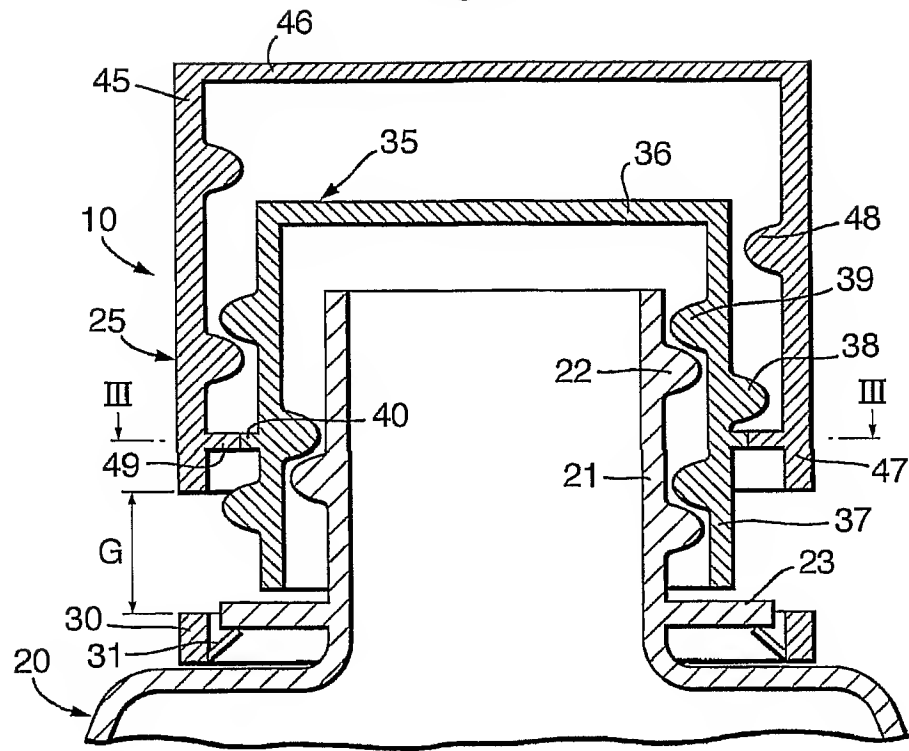


Fig.3.

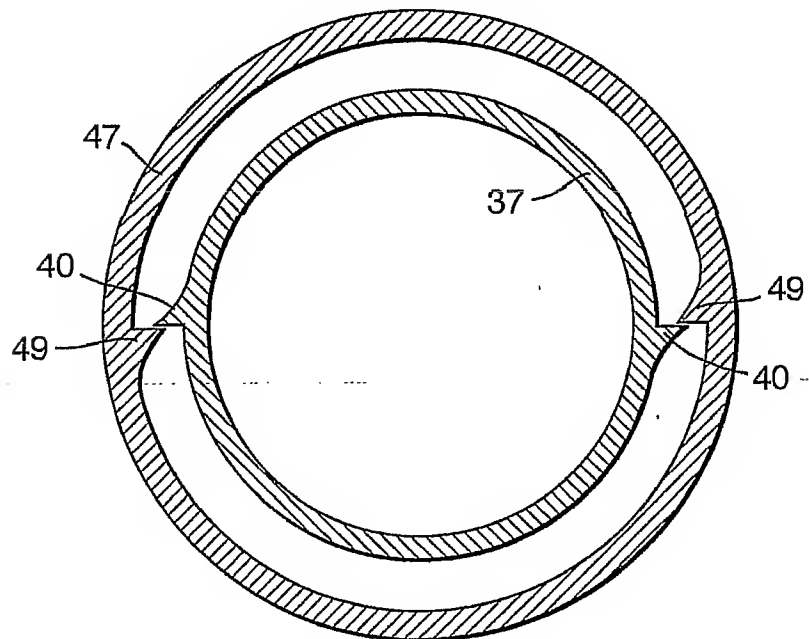
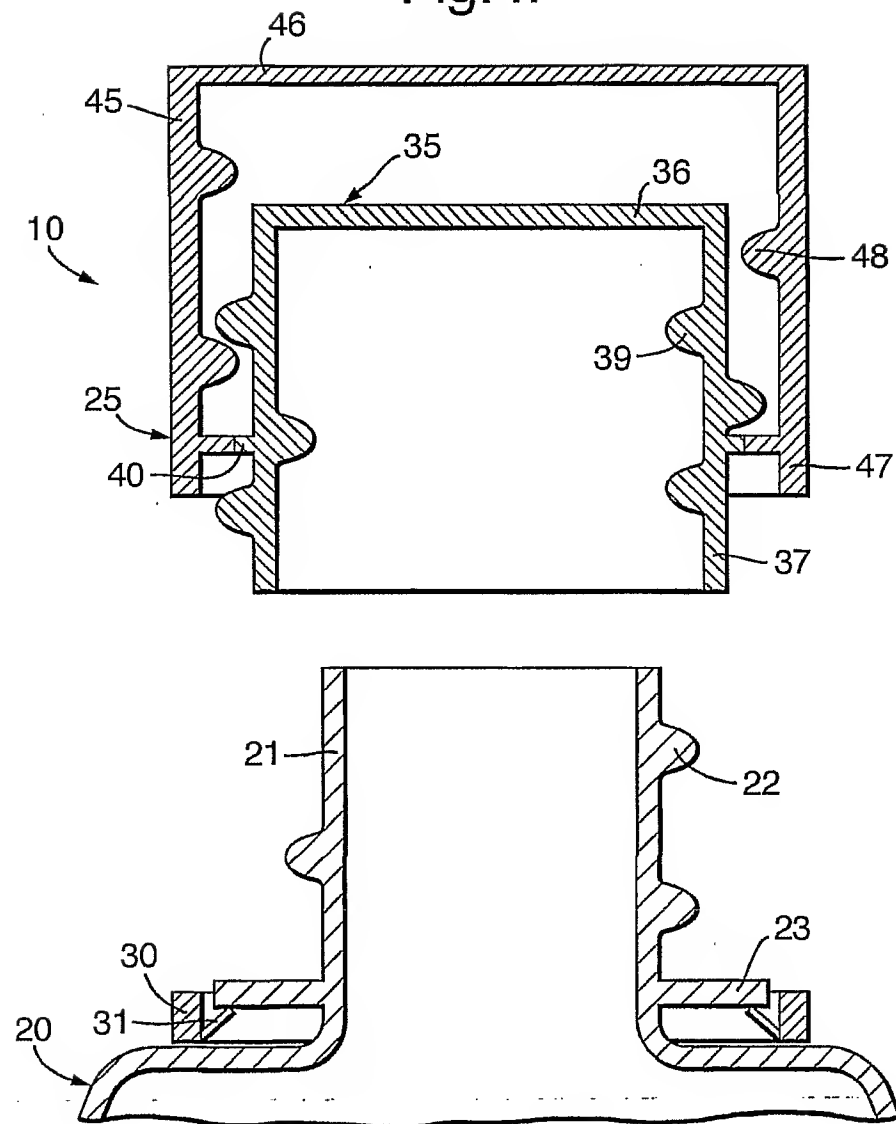


Fig.4.



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**Declaration under Rule 4.17:**

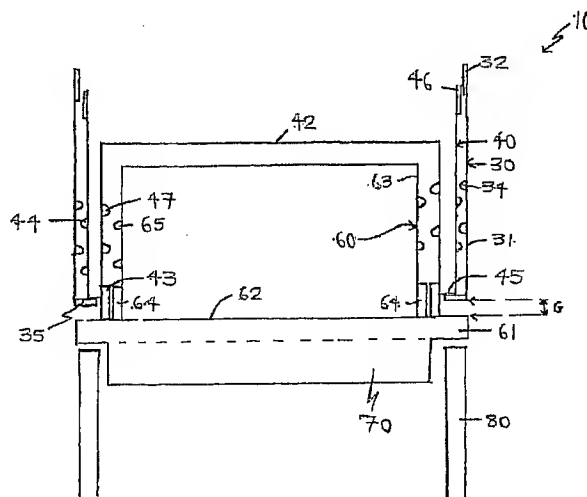
— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

**Published:**

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A TAMPER-EVIDENT CLOSURE



(57) Abstract: A tamper-evident closure (10) for a container (80), the closure (10) comprising a first portion including inner (40) and outer (30) parts, and a second portion (60), wherein the outer part (30) is movable relative to the inner part (40) from a first position in which the outer part (30) is immediately adjacent the second portion (60) to a second position in which there is an unobstructed gap (G) therebetween, and wherein the inner (40) and outer (30) parts are adapted to become irreversibly locked in the second position so that the outer part (30) cannot be moved back to the first position to close the gap (G), wherein means are provided to prevent the inner part (40) from moving relative to the second portion (60) until the outer part (30) has reached the second position.

WO 2006/117505 A1

## A TAMPER-EVIDENT CLOSURE

The present invention relates generally to a closure for a container and particularly to a closure with means for indicating that the closure has been opened at least  
5 once.

There is an increasing demand for tamper-indicating systems which clearly indicate to the consumer if a container has been tampered with and has, for instance, been re-filled with un-authorised contents. Whilst it is relatively easy to  
10 produce some form of tamper-evidence, it is much more difficult to provide tamper evidence which cannot be either overcome without causing the tamper-evidence system to activate, or activated and then returned to a visually identical state so as to appear non-activated.

15 A particularly useful method of providing tamper-evidence is to use a system in which a closure is initially located in a first position, but once removed can only be returned to a second position which is visually distinct from the first position. For example, US 5738231 describes a closure with a part which is moved during the opening process so that following opening it cannot pass back over a projection on  
20 the container finish. The result is that the closure can only return to a position in which it is axially displaced with respect to its original position. Document WO 02096771 describes a closure with a first portion with inner and outer parts, and a second portion. Initially a section of the inner part of the first portion protrudes below the level of the outer part and is held firmly by a region of the second

portion which is formed so as to have a reduced circumference. When the first portion is removed the section of the inner part is pulled from under the area of reduced circumference on the second portion. After removal the inner part of the first portion and the area of reduced circumference on the second portion retain  
5 their original dimensions, so that if the first portion is reapplied the inner part can no longer pass under the area of reduced circumference. Accordingly a gap is produced between the outer part of the first portion and the second portion, because the section of the inner part which was previously trapped under the second portion is now trapped above the area of reduced circumference.

10

In both of the above prior art documents a gap is formed by trapping an obstructing member. The problem with such systems is that the obstruction member is easily accessible and could be removed, for example by cutting to defeat the tamper-evidence.

15

The present invention seeks to address the above problem.

In one aspect, the invention provides a tamper-evident closure for a container, the closure comprising: a first portion including inner and outer parts, and a second  
20 portion, wherein the outer part is movable relative to the inner part from a first position in which the outer part is immediately adjacent the second portion to a second position in which there is an unobstructed gap therebetween, and wherein the inner and outer parts are adapted to become irreversibly locked in the second position so that the outer part cannot be moved back to the first position to close

the gap, characterised in that, the closure includes means for preventing the inner part from moving relative to the second portion until the outer part has reached the second position.

- 5 The present invention therefore does not rely on an obstructing member becoming trapped to form a gap therebetween. Consequently, it is not possible to defeat the tamper-evidence by simply removing the obstructing member by cutting.

The prevention means may comprise friction means between the first and second  
10 portions.

The friction means may be provided by two sets of ratchet teeth. Such teeth are simple to produce with plastic materials.

- 15 The second portion may be connected to a container and the first portion may comprise a cap. Certain industries demand closures with a first portion comprising a cap and a second portion comprising a sleeve which is connected to a container; for example the spirits industry.

- 20 The second portion may be permanently fixed in its position on the container. This prevents the second portion from being moved upwardly to close the gap.

The second portion may be adapted to engage a non-return fitment associated with the container. This is because certain industries, in particular the spirits industry, demand additional measures to prevent tampering. Non-return fitments fulfil this demand by preventing re-filling of the containers regardless of other tamper-evidence measures.

The first portion may include a ratchet arrangement for locking the inner and outer parts in the second position. A ratchet arrangement is a simple and efficient method of irreversibly locking the inner and outer parts together.

10

In another aspect the invention provides in combination a container and a tamper-evident closure, the closure comprising: a first portion including inner and outer parts, and a second portion, wherein the second portion is connected to the container and the first portion is a removable top cap, the first portion outer part is movable relative to the inner part from a first position in which the outer part is immediately adjacent the second portion to a second position in which there is an empty, unobstructed gap therebetween, thereafter the first portion is removable and the inner and outer parts are adapted to become irreversibly locked in the second position so that the outer part cannot be moved back to the first position to close the gap when the first portion is replaced, characterised in that, prevention means are provided to prevent the inner part from moving relative to the second portion until the outer part has reached the second position.

15  
20

The combination may further comprise a non-return fitment connectable to the container, the second portion being adapted to engage the fitment.

The present invention will now be more particularly described, by way of example,  
5 with reference to the following drawings, in which:

Figure 1 is an exploded side view of a closure arrangement formed in accordance with the present invention;

Figures 2A to 2F are views of a pourer part;

10 Figures 3A to 3F are views of an inner ratchet part;

Figures 4A to 4F are views of an outer ratchet part;

Figure 5 is a cross-section of an assembled closure shown in a first position;

Figure 6 is a cross-section of the closure of Figure 5 shown in a second  
15 position;

Figure 7 is a cross-section through the pourer with the inner and outer ratchet removed;

Figure 8A is a side view of the closure arrangement of Figure 1 shown assembled and in an unopened position;

20 Figure 8B is a side view of the closure arrangement of Figure 8C following initial opening and removal of a lid part; and

Figure 8C is a side view of the closure of Figure 8B when the lid has been replaced.

Referring first to Figure 1 there is shown a closure generally indicated 10. The closure 10 comprises: an outer ratchet 30; an inner ratchet 40; an optional sealing wad 50; and a pourer 60. The closure 10 is adapted to form part of a closure arrangement when fitted into an aluminium shell 20 and onto the neck 80 of a  
5 bottle via a sealing washer 70.

Figures 2A to 2F shows the pourer 60 in more detail. The pourer 60 comprises a base part 61 which is generally cylindrical and of a diameter approximately equal to the outer diameter of an associated container neck to which the closure may be  
10 fitted. The base part 61 has an upper surface 62. A small diameter cylinder 63 is mounted on the upper surface 62 and has an external screw thread 65. The combination of the base part 61 and the smaller cylinder 63 has a bore 64 running through it to allow the contents of the container to be poured once the closure has been opened. On the outer wall of the smaller cylinder 63 are located two sets of  
15 ratchet teeth 64.

Figures 3A to 3F show the inner ratchet 40 in more detail. The ratchet 40 has a cylindrical body 41. The body 41 is open at one end but closed by an upper plate 42 at the other. On the inner surface of the open end of the body 41 ratchet teeth  
20 43 are formed. Further, a screw thread 44 is formed on the outer surface of the body 41. A step 45 is provided between the outer surface on which the thread 44 sits and the inner surface on which the ratchet teeth 43 sit. The reason for the step 45 will be explained below. Two sets of ratchet teeth 46 are also formed on the outer surface of the body 41 at the end opposite to the open end. Finally, another

screw thread 47 is formed on the inner surface of the body 41 but axially above the ratchet teeth 43.

Figures 4A to 4F show the outer ratchet 30 in more detail. The ratchet 30 has a  
5 cylindrical body 31 which has a bore 32 running through it. On the inner surface of the upper end of the body 31 are formed a set of ratchet teeth 32. At the lower end and on the inner surface of the body 31 a thread 34 is formed. Finally, the body 31 has an annulus 35 at the lower end of the body 31 which narrows the bore 32.

10

Figure 5 shows a cross-section through an assembled closure 10 comprising the pourer 60, the inner ratchet 40 and the outer ratchet 30. The closure 10 is shown in combination with a container neck 80. The pourer 60 is held in place onto the container by the sealing washer 70 which fits inside the neck 80.

15

The closure 10 is shown in the initial unopened position. This is indicated by the fact that the annulus 35 of the ratchet 30 is flush against the upper surface 62 of the pourer 60.

20 Figure 5 shows the interrelationship between the various ratchet teeth and the screw thread of the pourer 60 and ratchet parts 30, 40.

Figure 6 shows a further cross-section of the closure 10. However, in this figure the closure has been particularly opened as is indicated by the gap "G" between upper surface 62 and annulus 35.

5 The partially opened state of Figure 6 is reached by the outer ratchet 30 being turned relative to the pourer 60. This rotation caused the threads 34 of the outer ratchet 30 to ride up the threads 44 of the inner ratchet 40. Ratchet teeth 32 and 46 do not prevent this relative rotation since they are arranged such that when they are rotated in this opening manner the teeth do not interlock but merely ride over each  
10 other in the well understood method of ratchet teeth.

By contrast ratchet teeth 64 and 43 do interlock when the closure is being opened. This ensures that the inner ratchet 40 and the pourer 60 do not initially rotate relative to one another.

15

Also shown in Figure 6 is the feature that annulus 35 is raised up away from upper surface 62 thus creating gap "G", but that the axial travel of annulus 35 is limited by step 45 on the underside of the inner ratchet 40. Once this position has been reached outer ratchet 30 cannot be rotated further relative to inner ratchet 40.

20

Accordingly, continued rotation of the outer ratchet 30 relative to the pourer 60 will overcome the interlocking ratchet teeth 64, 43 and thus allow the pourer 60 to unscrew itself from the inner ratchet 40. This is achieved through the interaction of threads 65 and 47. Eventually, the combination of inner and outer ratchets 40,

30 will be released from the pourer 60, such that the contents of the container may be dispensed via the bore 64 in pourer 60.

Figure 7 shows the pourer 60 and container neck 80 free of the inner and outer  
5 ratchets 40, 30.

When it is desired to close the container, the inner and outer ratchets 40, 30 are placed on the pourer 60 and rotated in the usual closing direction so that the threads 65, 47 may interact. Ratchet teeth 64, 43 are designed such that when  
10 rotated relative to one another in this closing direction the teeth do not interlock but merely ride over each other.

The combination inner and outer ratchets 40, 30 may only be rotated to the extent shown in Figure 6. This is because the underside of the ratchet teeth 43 on the  
15 inner ratchet 40 will butt up against the upper surface 62 of the pourer 60 thus preventing any further relative axial movement. Further, ratchet teeth 46, 32 interact with each other when the outer ratchet 30 is rotated in the closing direction. This prevents any relative rotation of the inner and outer ratchets 40, 30. This interaction between ratchet teeth 46 and 32 also acts to prevent the outer  
20 ratchet 30 being rotated in the closing direction even if the closure 10 has only been opened very slightly.

As soon as the closure 10 has been opened for the first time a gap "G" is created between the underside of annulus 35 and the upper surface 62. This gap can never be closed up again since the arrangement of ratchet teeth prevent this as explained above. This gap is still present even if the inner and outer ratchets 40, 30 are  
5 removed from the pourer 60 and then re-applied since ratchet teeth 46, 32 prevent the relative rotation of the inner and outer ratchets 40, 30.

Further, although not shown, the upper end of outer ratchet 30 could be sealed such that no tools may be used to overcome the opposed ratchet teeth 46, 32.

10

Further still, due to the cylindrical body wall 31 the opposed ratchet teeth 46, 32 cannot be tampered with from the lower side without obviously damaging the outer ratchet 30.

15 Consequently, the combination of these features prevents "re-setting" of the closure so as to eliminate the gap "G" and accordingly, the closure is vastly superior to the known prior art in this respect.

The closure 10 is shown in Figures 8A to 8C in combination with an ROPP (roll on  
20 pilfer proof) metal shell 20 which acts as type of sheath.

The shell 20 is split into three main parts: upper 21; middle 22; and lower 23. These three parts are separated by two lines of frangible bridges 24, 25. The upper part 21 is fixed to the outer ratchet 30 by well known means, so that to open the

closure the upper part 21 is grasped and turned. As the outer ratchet 30 rotates and moves axially away from pourer 60 the first line 24 of frangible bridges breaks. This breakage acts as tamper evidence. The gap "G" created as the closure is opened, and as discussed above, will be seen as a gap between the upper part 21 and the middle part 22, as shown in Figure 8C. The upper part 21 also acts as further tamper evidence means since it encloses the outer 30 and hence the inner 40 ratchets and is adhered to the outer ratchet 30 by such means as crimping or glueing. Accordingly, the opposed ratchet teeth 46, 32 are even more difficult to access so that re-setting of the closure is virtually impossible without visibly damaging the upper shell 21.

The middle and lower parts 22, 23 are used to ensure that the pourer 60 cannot be removed from the container neck 80. This is achieved because the lower part 23 is crimped onto the neck 80 as may be seen by reference 26. The outer ratchet 30 is held in the upper part 21 by crimping as may be seen by reference 28. Further the middle part 22 is crimped onto the base part 61 of the pourer 60 as may be seen by reference 27. Thus, if the pourer part is removed from the container neck 80, the lower line 25 of frangible bridges is broken which thus acts as tamper evidence.

Figure 8B shows a side view of one embodiment of the closure including an ROPP wherein the upper part together with the inner 40 and outer 30 ratchets have been removed revealing the pourer 60. The pourer 60 is affixed to a container 80 by means of the lower 23 and middle 22 parts of the ROPP being crimped over them.

Although crimping is discussed as the means of fixing the shell parts 21, 22, 23 to the closure 10, other methods such as glueing or welding could, of course, be used.

Another feature of the inner ratchet 40 may be seen in Figures 3A to 3F. This is the feature that the two sets of ratchet teeth are formed on a band 48 which is attached to the rest of the inner ratchet by means of narrow straps 49. The two sets of teeth fit closely to the corresponding teeth 32 on the inner surface of the outer ratchet 30. However, the band 48 has a circumference which is slightly smaller than the circumference of the bore of the outer ratchet 30. This allows a degree of flexibility in the band 48 as will be explained below. The straps 49 are spaced about the circumference of the inner ratchet 40 and form "windows" 49A between them. This arrangement further provides for a degree of flexibility in the band 48 and allows it to deform out of a circular shape when the closure is initially being opened. This allows the ratchet teeth 46, 32 to slip over one another as described above. This flexibility is necessary because the two sets of ratchet teeth 46 and 32 are arranged so that they fit very closely together. This closeness ensures that the outer ratchet 30 cannot be turned relative to the inner ratchet 40 in the closing direction since this relative rotation would eliminate the gap "G" and hence eliminate the evidence of the closure having been opened.

20

Although shown in this manner it should be understood that other arrangements are possible to allow the ratchet teeth to slip over one another. Also, there could be a different number, from the two sets described, of ratchet teeth 46.

In another embodiment, the outer surface of the lower end of the inner ratchet 40 (i.e. that part which has ratchet teeth 46 on its inner surface) could be brightly coloured. This would accentuate the presence of the gap "G" since it is this surface which is visible once the closure has been initially opened.

5

Although a closure according to the invention has been described above in combination with a metal ROPP it would also be possible to combine the closure with other types of material. Also, the closure could be affixed to an associated container by other means such as adhesive or welds. Further, since the basic  
10 combination of inner and outer ratchets and pourer is air tight in its own right this combination could be used without any other form of outer sheath.

Finally, although ratchet teeth 64, 46 are described as the friction means necessary to allow the closure to operate correctly, other means could be employed. For  
15 instance, roughened surfaces could be chosen to provide enough friction to "lock" the pourer 60 and inner ratchet 40 together, on initial opening, whilst the outer ratchet 30 is rotated relative to the inner ratchet 40 but not to provide enough friction to prevent the inner ratchet 40 and pourer 60 being rotated relative to one another after the gap "G" has been created and with continued rotation of the outer  
20 ratchet 30.

Other means that might be employed are the use of such materials as VELCRO (RTM) or adhesive.

## CLAIMS

1. A tamper-evident closure (10) for a container (80), the closure comprising:  
a first portion including inner (40) and outer (30) parts, and  
5 a second portion (60),  
wherein the outer part (30) is movable relative to the inner part (40) from a  
first position in which the outer part (30) is immediately adjacent the second  
portion (60) to a second position in which there is an unobstructed gap (G)  
therebetween, and wherein the inner (40) and outer (30) parts are adapted to  
10 become irreversibly locked in the second position so that the outer part (30) cannot  
be moved back to the first position to close the gap (G),  
characterised in that,  
the closure includes means for preventing the inner part (40) from moving  
relative to the second portion (60) until the outer part (30) has reached the second  
15 position.
2. A closure according to Claim 1, wherein the prevention means comprises  
friction means between the first and second portions.
- 20 3. A closure (10) according to Claim 2, wherein the friction means are  
provided by two sets of ratchet teeth (64, 32).

4. A closure (10) according to any of Claims 1 to 3, wherein the second portion (60) is adapted to be connected to a container (80) and the first portion comprises a cap.

5 5. A closure (10) according to any preceding Claim, wherein, in use, the second portion (60) is permanently fixed in its position on the container.

6. A closure (10) according to any preceding Claim, wherein the second portion (60) is adapted to engage a non-return fitment associated with a container.

10

7. A closure (10) according to any preceding Claim, wherein the first portion includes a ratchet arrangement (46, 32) for locking the inner (40) and outer parts (30) in the second position.

15 8. In combination, a closure (10) according to any preceding Claim and a shell (20) in to which the closure is fitted.

9. In combination a container (80) and a tamper-evident closure (10), the closure (10) comprising:

20 a first portion including inner (40) and outer (30) parts, and

a second portion (60),

wherein the second portion (60) is connected to the container (80) and the first portion is a removable top cap, the first portion outer part (30) is movable relative to the inner part (40) from a first position in which the outer part (30) is

immediately adjacent the second portion (60) to a second position in which there is an empty, unobstructed gap (G) therebetween, thereafter the first portion is removable and the inner (40) and outer (30) parts are adapted to become irreversibly locked in the second position so that the outer part (30) cannot be moved back to the first position to close the gap (G) when the first portion is replaced,

characterised in that,

prevention means are provided to prevent the inner part (40) from moving relative to the second portion (60) until the outer part (30) has reached the second position.

10. A combination according to Claim 9, wherein the combination further comprises a non-return fitment connectable to the container, the second portion (60) being adapted to engage the fitment.

1/8

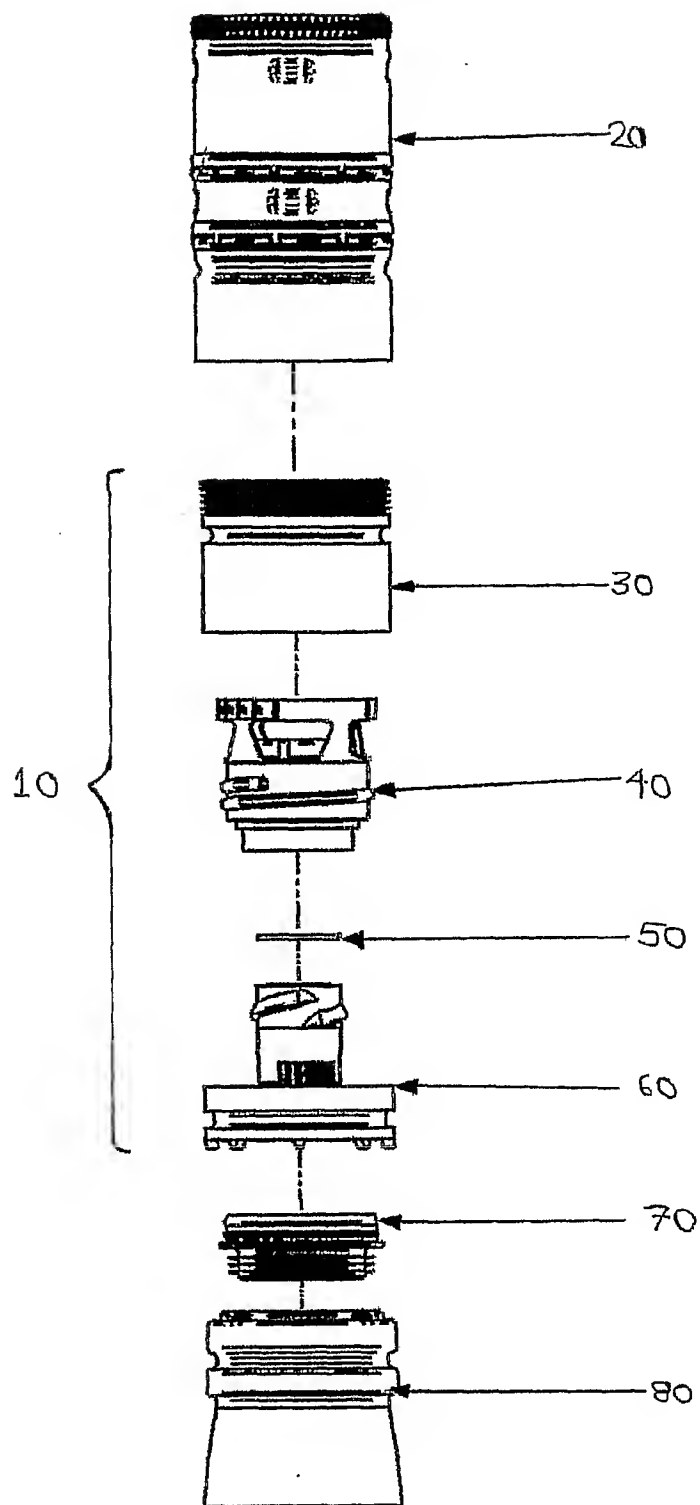


FIGURE 1

2/8

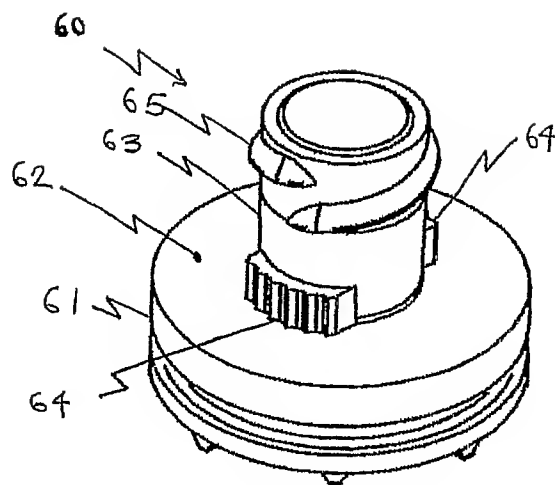


FIGURE 2A

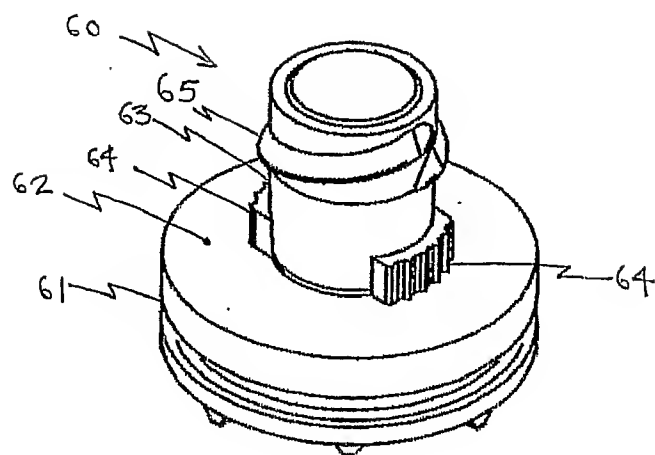


FIGURE 2B

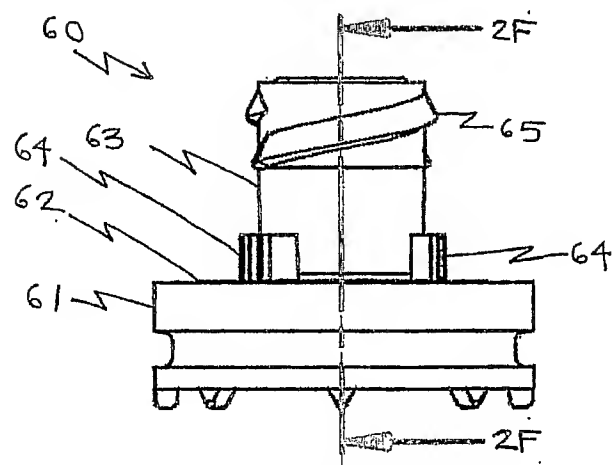


FIGURE 2C

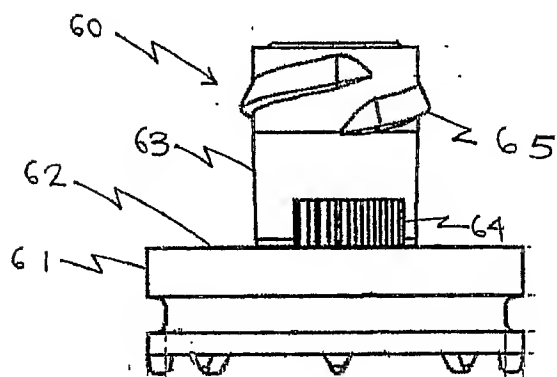


FIGURE 2D

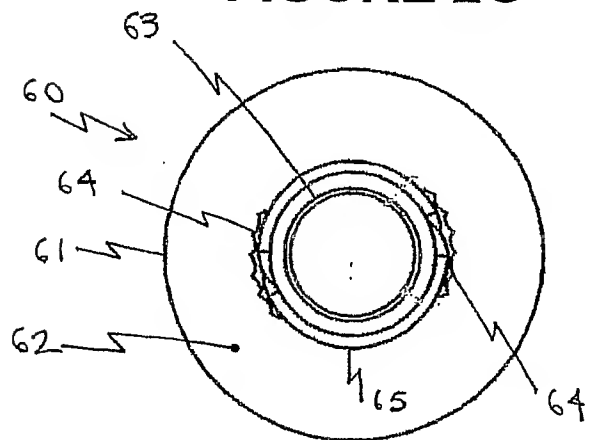


FIGURE 2E

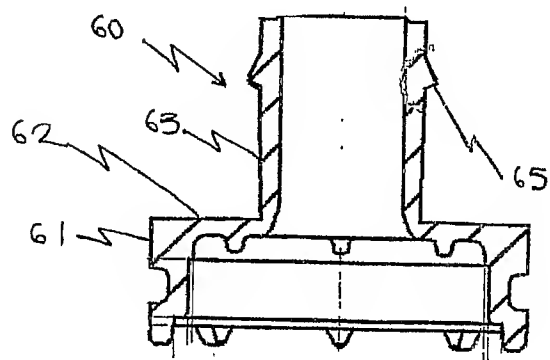


FIGURE 2F

3/8

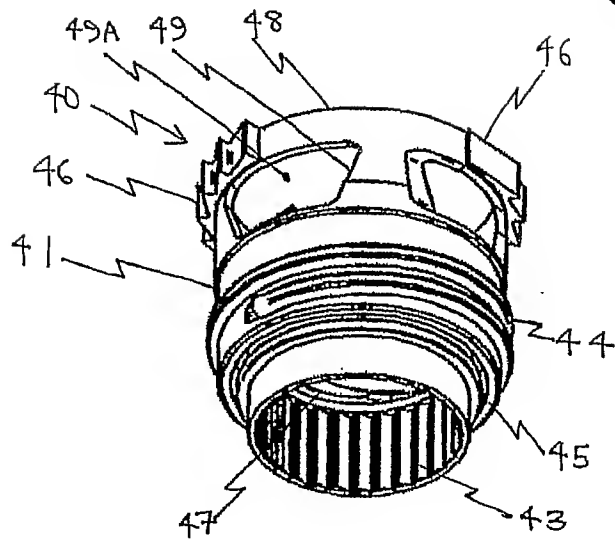


FIGURE 3A

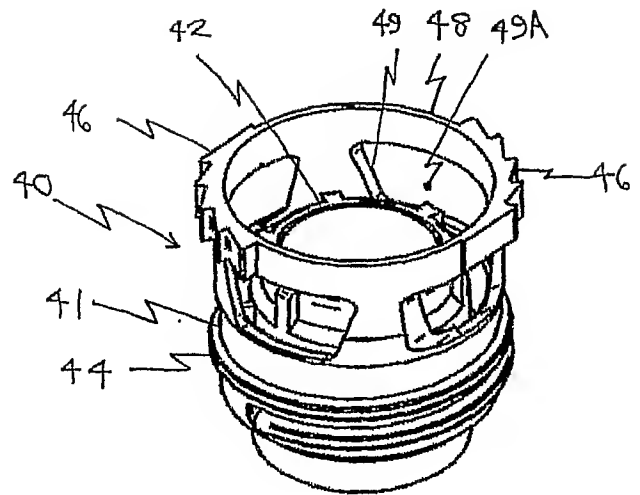


FIGURE 3B

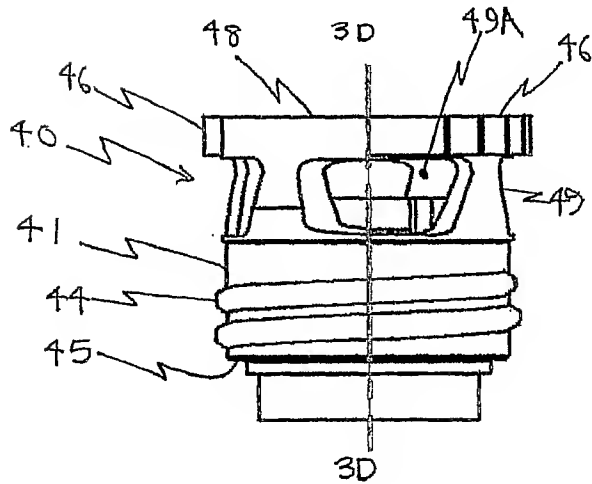


FIGURE 3C

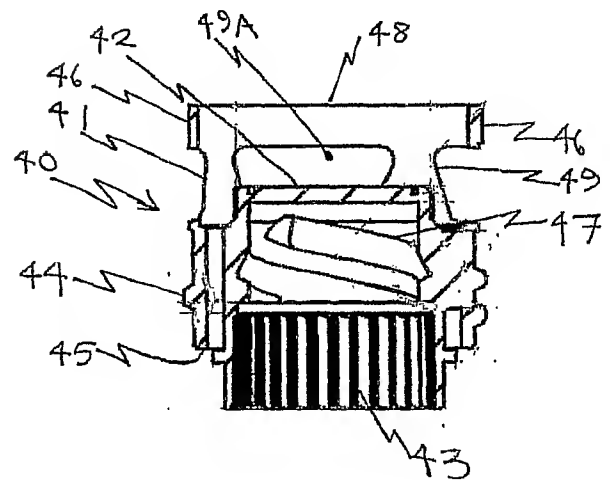


FIGURE 3D

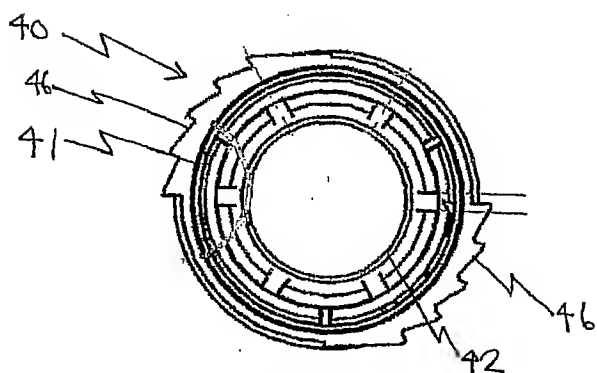


FIGURE 3E

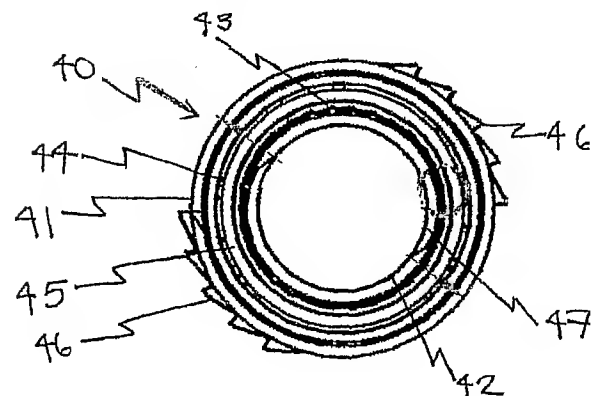


FIGURE 3F

4/8

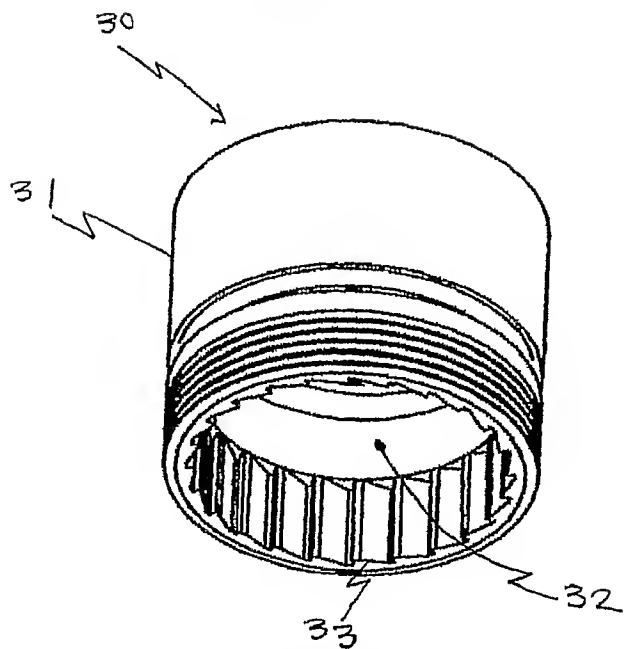


FIGURE 4A

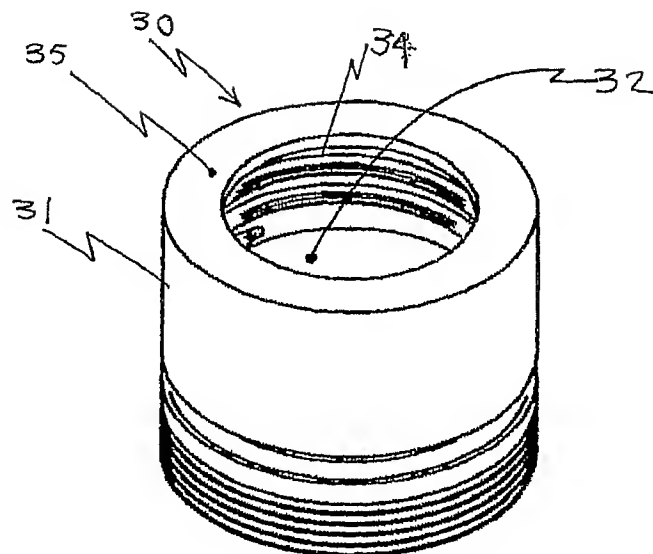


FIGURE 4B

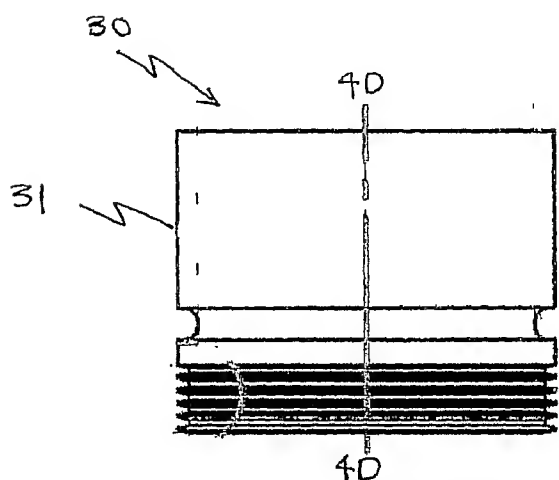


FIGURE 4C

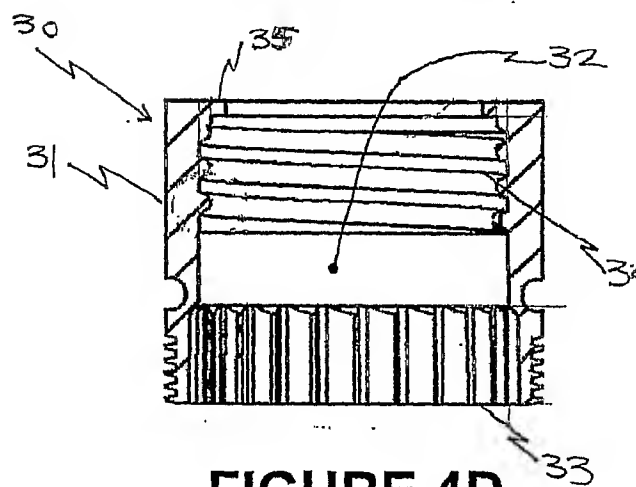


FIGURE 4D

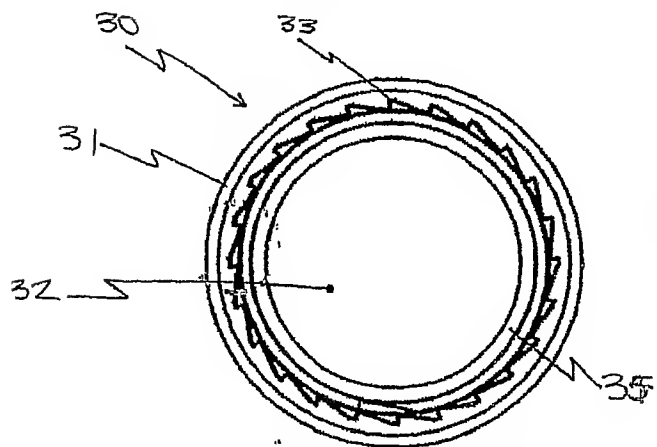


FIGURE 4E

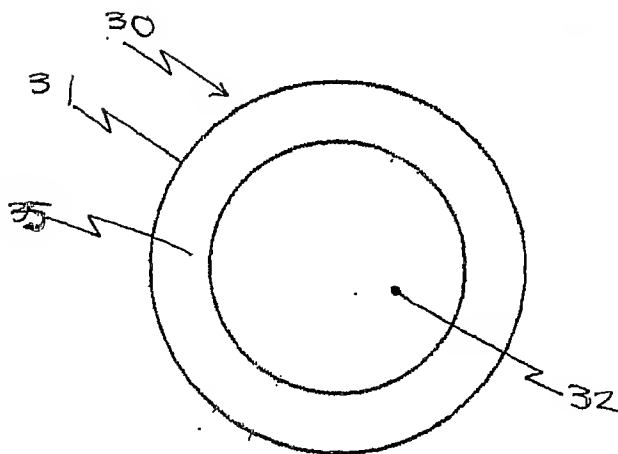


FIGURE 4F

5/8

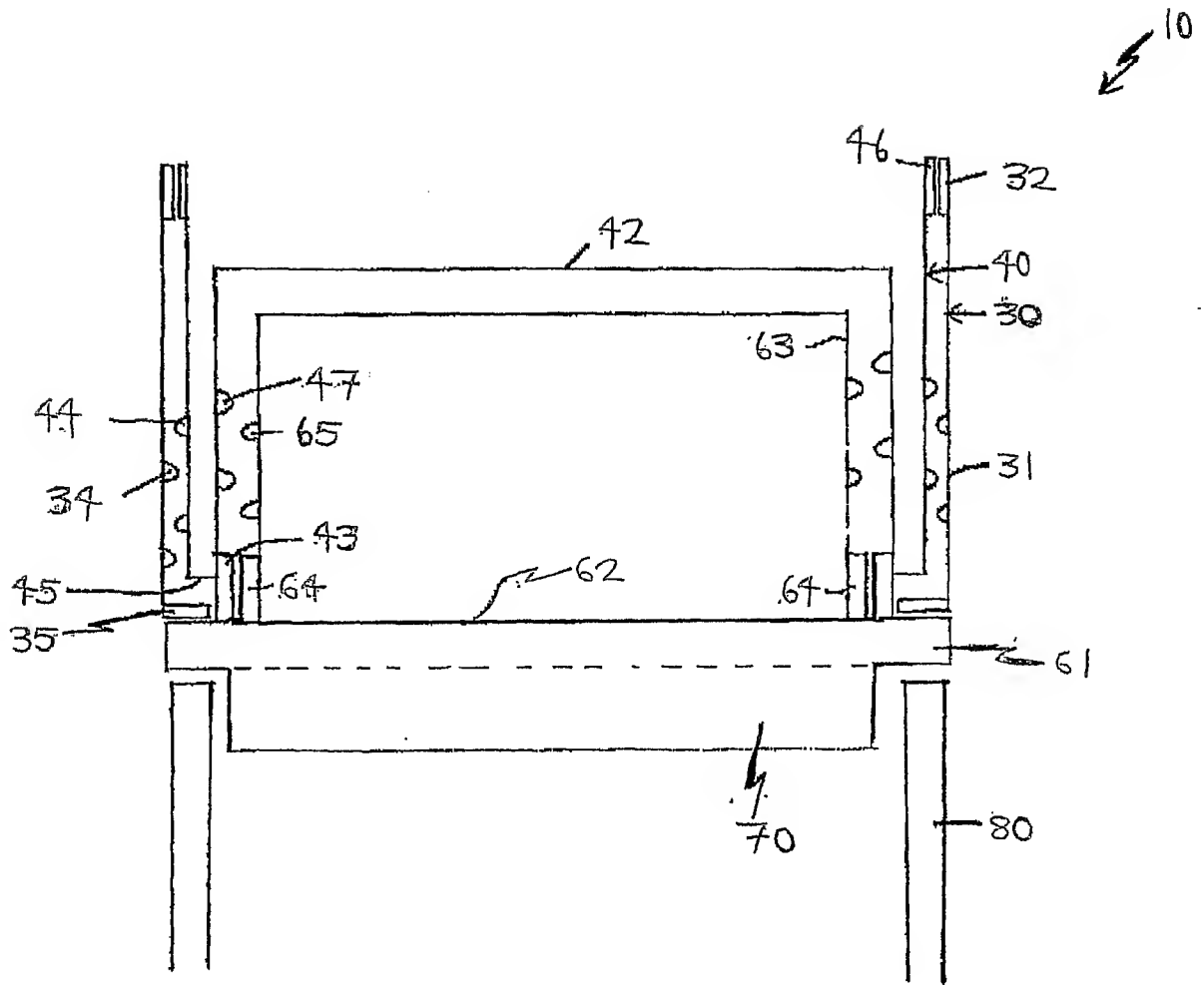


FIGURE 5

6/8

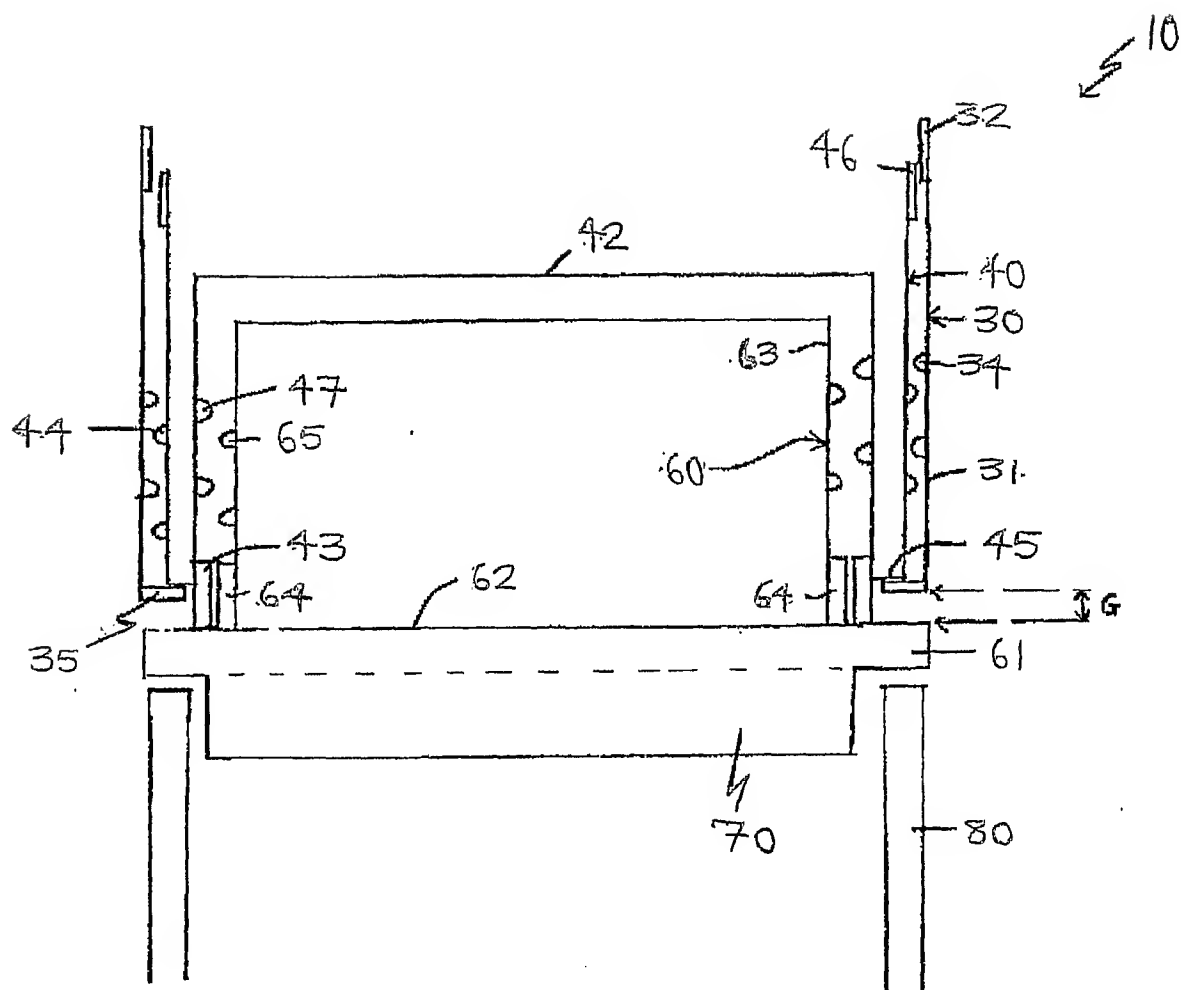


FIGURE 6

7/8

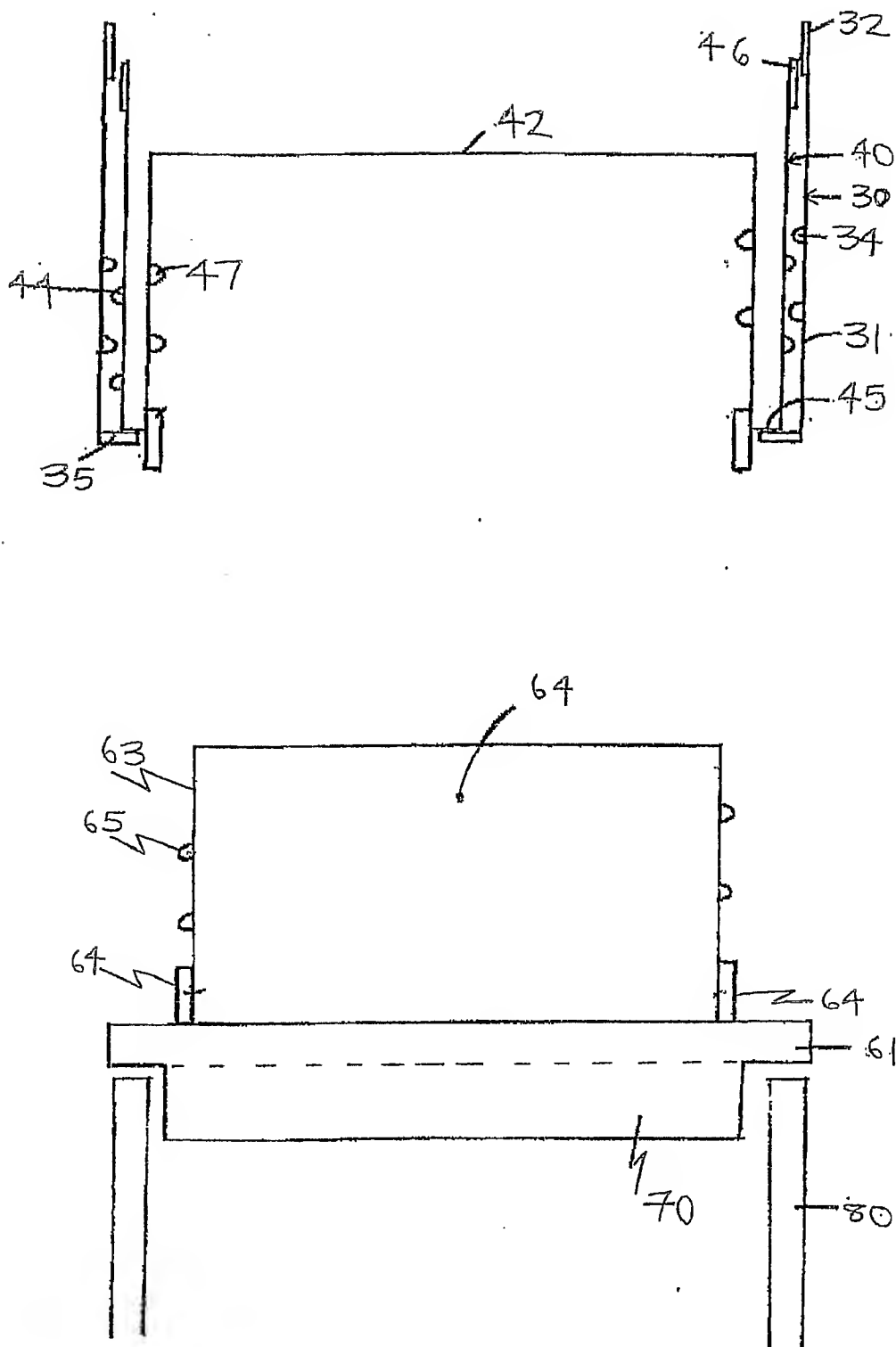
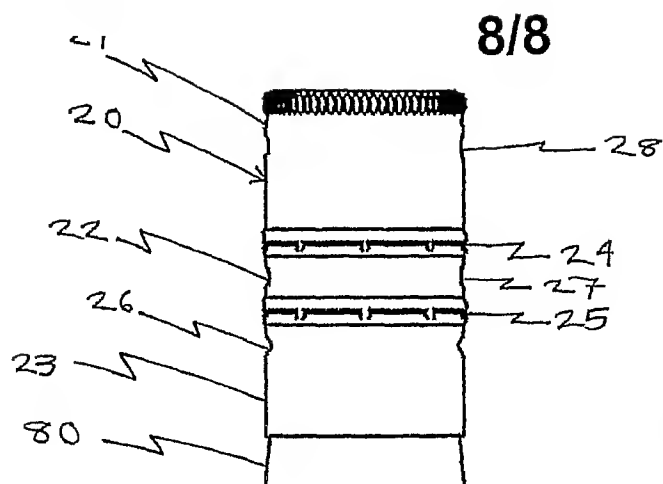
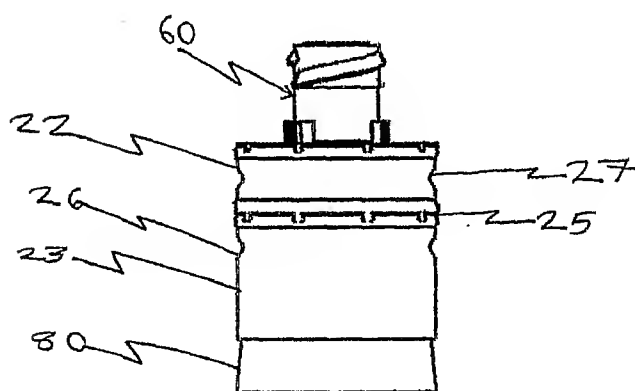


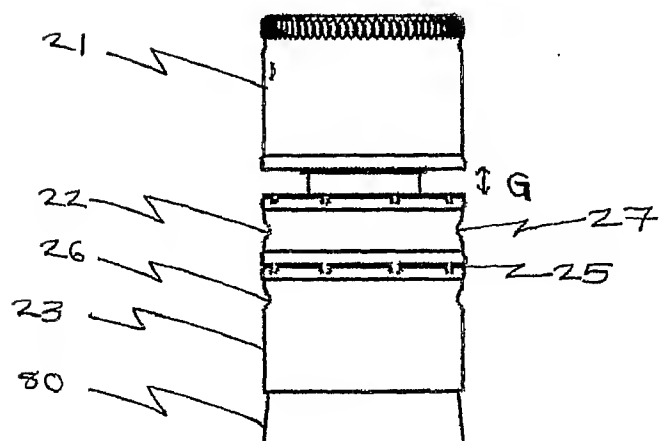
FIGURE 7



**FIGURE 8A**



**FIGURE 8B**



**FIGURE 8C**

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2006/001372

A. CLASSIFICATION OF SUBJECT MATTER  
INV. B65D55/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 923 184 A (CHOKSI ET AL) 2 December 1975 (1975-12-02) the whole document	1-10
A	US 3 971 488 A (MCROSKEY ET AL) 27 July 1976 (1976-07-27) the whole document	1-10
A	US 3 817 416 A (COSTA A, US) 18 June 1974 (1974-06-18) the whole document	1-10
A	FR 782 818 A (ANCHOR CAP & CLOSURE CORPORATION) 12 June 1935 (1935-06-12) the whole document	1, 9, 10
	----- -/-	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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# INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2006/001372

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 2004/129729 A1 (THOMSON DAVID WILLIAM ET AL) 8 July 2004 (2004-07-08) cited in the application the whole document</p> <p>-----</p>	1,9,10

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2006/001372

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3923184	A	02-12-1975	NONE
US 3971488	A	27-07-1976	NONE
US 3817416	A	18-06-1974	CA 962627 A1 11-02-1975 DE 2246879 A1 21-02-1974 DE 7235159 U 21-04-1977 FR 2194620 A1 01-03-1974 GB 1408797 A 08-10-1975 IT 970182 B 10-04-1974 JP 49044872 A 27-04-1974
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US 2004129729	A1	08-07-2004	AT 305420 T 15-10-2005 BR 0210018 A 10-08-2004 CN 1524053 A 25-08-2004 EA 5536 B1 28-04-2005 EP 1392575 A1 03-03-2004 ES 2249582 T3 01-04-2006 WO 02096771 A1 05-12-2002 GB 2377699 A 22-01-2003 MX PA03010696 A 07-03-2005 PL 367335 A1 21-02-2005

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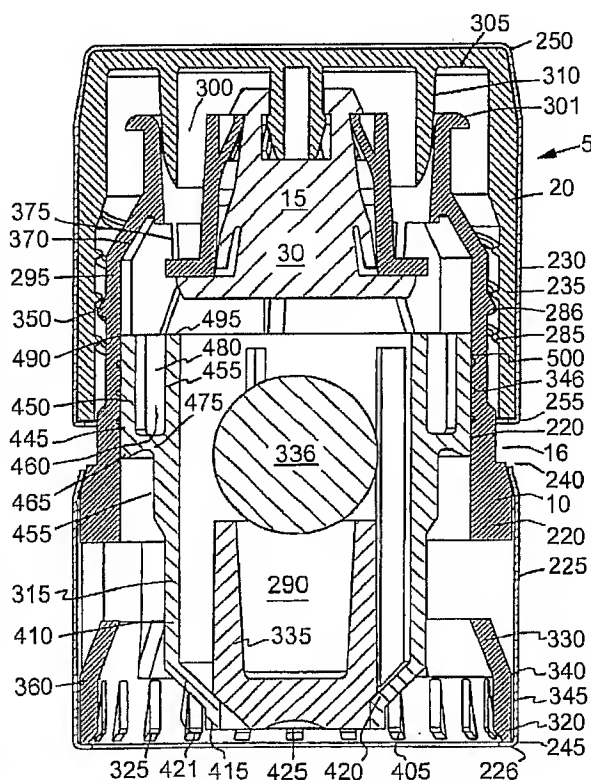
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(54) Title: LIQUID CONTAINER CLOSURE ASSEMBLY



RECLOSED AFTER OPENING

(57) Abstract: There is disclosed an improved closure assembly (5) adapted to be applied to a mouth and neck portion of a container (e.g. for liquid) such as a neck of a bottle. Known container closure assemblies suffer from a number of problems, e.g. simplicity of manufacture and provision of tamper evidence. Accordingly, the closure assembly (5) (or tamper-evident device) of the present invention comprises: a first body part (10); a tamper-evident member or lock means (15); and a container closure member (20), wherein prior to initial opening the tamper-evident member or lock means (15) is in a first position such that the first body part (10) and the container closure member (20) are disposed in a first relation to one another, and initial opening of the closure assembly (5) causes the tamper-evident member or lock means (15) to move a second position. Upon reclosure the lock means (15) causes the first body part (10) and the container closure member (20) to be disposed in a second (spaced) relation to one another, thereby evidencing opening and reclosure.



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LIQUID CONTAINER CLOSURE ASSEMBLYFIELD OF INVENTION

5 The present invention relates to a closure assembly adapted to be applied to a mouth of a container, e.g. for liquid, such as a neck of a bottle. The invention particularly, thought not exclusively, relates to a tamper-evident snap-on fitment or tamper-evident non-refillable snap-on fitment.

10

BACKGROUND TO INVENTION

For various reasons, it may be desirable to ensure that a used container, such as a bottle intended to contain a liquid such as a valuable liquid, e.g. alcoholic beverages such as spirits, is not re-filled with a replacement quantity of another liquid, the characteristics and quality of which may differ from the original contents.

15 Attempts to provide closures which make such re-filling difficult are not always proof against determined re-filling efforts.

20 Also, while it is considered advantageous to provide a tamper-indicating means which provides evidence that the bottle and its original contents are intact, if the bottle is resealable with a substitute cap or closure, there may be little to indicate to a purchaser that the bottle has been tampered with and/or refilled and that the contents may be inferior to the original contents.

25 It has, therefore, been found desirable to provide a closure which cannot be removed without an extreme level of effort or breakage being caused to the bottle. Such an arrangement is shown, for example, in GB Patent No. 2 274 837 also by the present Applicant, selected merely by way of illustration.

Whilst it is very important that an original closure

cannot be removed without visible damage or breakage being caused either to the closure and/or to the bottle, it has been found that a closure that cannot readily be removed will become the target of attempts to re-fill the container by overcoming the feature provided in the closure intended to hinder or prevent such refilling. Therefore, in addition to providing devices to prevent re-filling of bottles, there is a need to provide such devices with further tamper-indicating or "tamper-evident" features which, while not acting in any preventive role, give a clear irremovable and/or irreversible indication that a bottle has been opened since being originally filled with the genuine contents. Such clear indicators have been somewhat lacking in previous closure designs.

Furthermore, there is a need for simple designs of closure assemblies allowing easy and reliable manufacture, assembly and fitting to bottle necks. Such simplicity has been somewhat lacking in previous closure designs.

Accordingly it is an object of at least one embodiment of at least one aspect of the present invention to obviate or at least mitigate at least one of the aforementioned problems/disadvantages in the prior art.

It is also an object of at least one embodiment of at least one aspect of the present invention to provide an improved closure assembly which does not have any parts which are frangible and/or removed upon initial opening and which are liable to be reattached by counterfeiters or the like in a way suggesting that the closure assembly had not previously been opened.

30

#### SUMMARY OF INVENTION

One or more objects of the present invention are addressed by the general solution of providing a container closure assembly having a first tamper-evident or tamper

evidence member which irreversibly moves from a first position to a second position upon initial opening. Such action may cause a first body part and a container closure member, which prior to initial opening are disposed in a first disposition relative to one another, to be disposed in a second disposition relative to one another upon reclosure so as to evidence opening and reclosure of the closure assembly.

According to a first aspect of the present invention there is provided a closure assembly (or tamper-evident device) adapted to be applied to a mouth and neck portion of a container for liquid, the assembly comprising:

a first body part,  
a tamper-evidence member or lock means, and  
a container closure member,

wherein prior to initial opening the tamper-evidence member or lock means is in a first position such that the first body part and the container closure member are disposed in a first relation to one another, and initial opening of the closure assembly causes the tamper-evidence member or lock means to move to a second position.

The Applicant has named the device of the present invention "ALUSNAP" (Trade Mark) closure assembly, tamper-evident device, snap-on fitment or non-refillable device.

Preferably upon reclosure of the closure assembly the lock means causes the first body part and the container closure member to be disposed in a second relation to one another.

In this way a clear indication is given to a person that the closure assembly has been opened and reclosed. The lock means therefore provides a first visual tamper-evidence means.

Preferably the lock means comprises a lock member retained within the first body part. The lock member may

comprise a lock body portion having a first flanged end. Preferably also the lock body portion has a second flanged end.

Preferably the first flanged end and an inner side of the container closure member are provided with co-acting engagement means. By such arrangement in an initially unopened disposition the container closure member and lock member are held together, and an initial opening action of the container closure member causes the lock member to move from said first position to said second position.

The co-acting engagement means may comprise a resiliently flexible male member provided on the inner side of the container closure member and a female member provided at the first end of the lock member.

Preferably once the lock member is in said second position, further opening action (whether initial or reopening) causes the male member to release from the female member.

Preferably the first body part provides a tubular body having open first and second ends, the first end having a plurality of circumferentially spaced teeth.

Preferably the assembly includes a pouring outlet device including a pouring lip, the tubular body being provided within the pouring outlet device.

Preferably said teeth are resiliently flexible.

Preferably in said initially unopened position, said flanged first end of said lock member is within said tubular body, and an initial opening operation of said container closure member causes said flanged first end of said lock member to move passed said teeth and out of said first end of said tubular member. The teeth therefore act as non-return means or "barbs" by which said flanged first end of said lock member is prevented from re-entering said tubular member.

In said second position, the second flanged end of the lock body portion may abut a flange provide on the second end of the tubular body.

Preferably the lock body portion carries biasing means, which tend to bias the lock member towards said first position.

Preferably said second flanged end of said lock body portion substantially seals or closes a mouth of a container when in said first position and said closure assembly is applied to a container.

The bias means may comprise one or more sprung arms extending from said lock body portion towards said second end thereof.

The closure assembly may comprise a snap-on fitment.  
The closure assembly may include means to prevent refilling.

The teeth may each extend from the tubular body and comprise an angled portion and a substantially longitudinally extending end portion.

The first body part, lock member and container closure member may be made from suitable plastics materials.

In an embodiment the first body part may comprise a sleeve adapted to lie substantially concentrically with respect to the mouth and provided with means for fixing the sleeve on the container, the closure assembly preferably further comprising a first outer sleeve being a substantially tight fit with the sleeve but rotatable with respect thereto, and a second outer sleeve separate from the first outer sleeve and associated with the container closure member, and wherein there are provided means for spacing apart initially adjacent portions of the first and second outer sleeves upon reclosure of the assembly after an initial opening of the container.

The spacing means provide a second visual tamper-

evidence means.

Preferably the first outer sleeve has open first and second ends and the second outer sleeve has a first closed end and second open end.

5        Preferably the container closure member includes a circumferential groove, which may further provide a circumferential lip portion located below and adjacent to the circumferential groove.

10       The initially adjacent portions may comprise adjacent respective circumferential edges of the first and second outer sleeves.

The first and second circumferential edges may prior to initial opening be located in the circumferential groove and may be adjacent one another.

15       Preferably, during an initial container opening operation, the first circumferential edge expands or rides over the circumferential lip portion and then recoils or retracts, preferably to substantially its original circumferential position so as to become positioned  
20       circumferentially behind the circumferential lip portion. Alternatively or additionally during an initial container opening operation, the circumferential lip portion contracts or rides under the first circumferential edge and then recoils or expands preferably to substantially its  
25       original circumferential position so as to become positioned circumferentially ahead of the first circumferential edge. This action positions the circumferential lip longitudinally between the first and  
30       that when the container is reclosed by re-applying the closure member, the first and second outer sleeves are spaced apart at least by the circumferential lip portion located therebetween.

The first and optionally second tamper evidence means

provide that after reclosure the first and second circumferential edges are no longer adjacent but spaced, thus revealing a void or gap between the first and second circumferential edges. This visual indicator evidences  
5 that the closure assembly (and container) has been opened and reclosed.

The first circumferential edge of the first outer sleeve may provide a circumferential first beaded portion on the first outer sleeve, and in a same manner the second  
10 circumferential edge of the second outer sleeve may provide a circumferential second beaded portion on the second outer sleeve.

The first and second sleeves may comprise any suitable material, and preferably the material comprises a metal, or  
15 metallic based material.

Preferably the metal or metallic based material substantially comprises aluminium or an alloy thereof, and particularly rolled aluminium.

Advantageously, aluminium provides a good medium for  
20 application of printing dyes, inks, paints or the like such that messages, logos, images, names, and/or other information may be carried by the first and/or second outer sleeves. A message may, for example, comprise arrows indicating a direction of rotation for opening of the  
25 closure assembly.

The container closure member may be a cap which desirably includes a threaded portion which allows a rotational movement (normally anti-clockwise) of the cap during a container opening operation.

30 The closure assembly may include a non-refillable device providing pouring outlet device adapted to be secured to the mouth of a container for liquid. The container closure member may be a cap adapted to close an outlet of the pouring outlet device, and the first outer

sleeve may be adapted to receive at least part of the pouring outlet device. The outlet may be substantially annular and the cap may carry on an inner facing end an annular seal removably receivable within the annular outlet.

Preferably the second outer sleeve member is adapted to receive at least part of the cap.

The cap may be generally received in a tight interference fit to the second outer sleeve, but may be optionally rotatable with respect to the second outer sleeve upon application of sufficient force.

Desirably the pouring outlet device is made in one piece with the sleeve, e.g. by injection moulding.

Preferably the non-refillable device further comprises a valve seat body which is at least partially receivable within at least part of the neck portion of the container, and wherein the valve seat body is at least partially surrounded by the sleeve.

Preferably at least one moveable valve member is provided within the valve seat body.

Preferably there are provided means for retaining the first outer sleeve in longitudinal relation to the sleeve, e.g. an end of the first outer sleeve at least partially formed over an end of the sleeve.

Preferably the first and second circumferential edges of the first and second sleeves are before an initial opening of the closure assembly located within the circumferential groove provided on the closure member, and are substantially adjacent. This positioning ensures that when the container is initially opened by relative twisting of the closure member and sleeve, the second circumferential edge of the second outer sleeve remains within the groove provided on the closure member, and the first circumferential edge of the first outer sleeve

progressively resiliently may be caused to move circumferentially outward and out of the groove provided on the closure member as the closure member is removed away from the pouring outlet device and the first portion.

5 Alternatively or additionally the circumferential lip portion may progressively be caused to move circumferentially inward. On removing the contact between the cap and the first circumferential edge of the first outer sleeve, the first circumferential edge retracts to a

10 substantially reduced circumference, (e.g. its original circumference), such that the resulting circumference is less than that of a portion of the closure member which is located below the groove. This portion is preferably provided as the circumferential lip on the closure member.

15 When the closure member is re-applied to the pouring outlet device, a stop position is reached when the circumferential lip portion of the closure member rests, sits or abuts upon the first circumferential edge of the first outer sleeve, thus preventing the closure member

20 being returned to its original unopened starting position. A longitudinal gap or void therefore remains between the first and second outer sleeves thus exposing a circumferential part of the closure member, which part includes at least part of the circumferential lip which was

25 originally encased or enclosed within the first circumferential edge and an original closure member seating surface of the pouring device.

Advantageously the exposed circumferential part of the closure member may be distinctly coloured and/or printed

30 with information, promotional messages or the like.

The fixing means may comprise first means for fixing the sleeve on the container so as to restrain rotational movement of the sleeve with respect to the neck portion of the container.

The fixing means may also comprise second means for fixing the sleeve on the container so as to restrict longitudinal movement of the sleeve with respect to the mouth of the container.

5        Preferably the second means for fixing the sleeve are in the form of at least one projecting means projecting inwardly of said sleeve, said at least one projecting means being moveable radially of the sleeve in a stiffly resilient manner and being engagable with an outer lip  
10        portion of said container.

Preferably the first outer sleeve fits with the sleeve by means of an interference fit between an outer surface of the sleeve and an inner surface of the first outer sleeve.

15        Preferably the cap has thereon a threaded portion, which engages with a corresponding threaded portion on the first body part or pouring outlet.

It is desired that the first and second outer sleeves are aesthetically pleasing, and as such, it is preferred that the first and second outer sleeves comprise metal  
20        foil.

It is preferred that there are provided means for assembling the sleeve and valve seat body together prior to application to the container.

25        Preferably the projecting means are provided on an inner wall of the sleeve to resiliently engage the neck portion of the container.

Preferably the sleeve contains one or more circumferential apertures around the sleeve, which are defined between axially extending portions of the sleeve.  
30        The/each projecting means may be provided adjacent to an edge of one of the apertures. It is preferred that each projecting means is positioned on a lower circumferential edge of one of the apertures.

Typically the pouring outlet device comprises a

circumferentially extending pouring lip.

The sleeve may further be provided with a tubular body position inwardly and preferably concentrically of the pouring outlet device and wherein the tubular body is  
5 attached to an inner surface of the sleeve via a plurality of webs.

Preferably said first end of said tubular body is positioned to be substantially flush with the circumferentially extending pouring lip.

10 Conveniently said tubular body is provided with a circumferentially extending brim which is positioned on the lower outer edge of said tubular body. Conveniently webs connect an inner surface of the sleeve to the brim and to the tubular body.

15 Conveniently each web is configured to provide a bracket upon which the brim fixedly sits.

The sleeve is further conveniently provided with a plurality of ribs or ridges formed on an inner surface thereof, preferably arranged circumferentially around the  
20 sleeve and having their long axes arranged substantially axially to said sleeve.

These ribs or ridges, in use, may co-act with raised pips, ridges or the like, on an outer surface of the container (e.g. a "glass finish" of the bottle) to seek to  
25 prevent undesired rotational movement of the sleeve.

The valve seat body may comprise a tubular portion, a free end portion of which provides a valve seat adapted to be contacted in a sealing manner by a valve member captive in said tubular portion.

30 The valve seat is preferably a circumferentially extending flange, which extends radially inwardly of the tubular portion. In one embodiment such a valve seat is positioned at one end of the tubular portion, and that end of the tubular portion is closed except for a circular

aperture.

It will be understood that the tubular portion is adapted to be received substantially within the mouth portion of the container.

5       The tubular portion may further comprise at least one engagement means on an outer surface thereof to engage an inner surface of the container in an interference fashion. The engagement means are preferably radially extending circumferential ribs.

10       At or near to an end of the tubular portion distal from the valve seat is provided a substantially concentric further tubular portion of greater diameter than the tubular portion, and an inner surface of the further tubular portion is connected to an outer surface of the  
15 tubular portion by one or more further webs.

It is preferred that a first end of the further tubular portion is connected to an outer surface of the tubular portion by an annular flange.

Thus, in one embodiment of the present invention, such  
20 construction provides a circumferential trough defined between the outer surface of the tubular portion and the inner surface of the further tubular portion with the flange forming a trough floor. The trough is divided into smaller arc-shaped troughs by the further webs.

25       Such a trough helps prevent insertion of objects into the container through the closure assembly.

Preferably a second end of the further tubular portion is arranged substantially flush with an end of the tubular portion distal from the valve seat.

30       In use the tubular portion forms an inner sleeve of the assembled closure assembly.

Advantageously, an outer surface of the further tubular portion interference interacts with an inner surface of the sleeve.

Conveniently, a radially extending circumferential rim is located on an outer edge of an end of the further tubular portion, which in an assembled closure assembly is seated against a lower surface of a radially extending circumferential rim provided on an inner surface of the sleeve.

According to a second aspect of the present invention there is provided a container including a closure assembly according to the first aspect of the present invention.

10 The container is preferably a container for liquid.

The container may be a bottle, e.g. a glass bottle, and may be adapted for containment of liquid, such as alcoholic drinks or beverages, e.g. spirits such as vodka, whisky, brandy, gin or the like.

15 According to a third aspect of the present invention there is provided a combination of a container and a closure assembly according to the first aspect of the present invention.

20 According to a fourth aspect of the present invention there is provided an alcoholic drinks product comprising an alcoholic substance packaged in the combination according to the third aspect of the present invention.

According to a fifth aspect of the present invention there is provided a method of manufacturing a closure assembly according to the first aspect of the present invention comprising the steps of:

- (a) providing an outer sleeve member;
- (b) providing a pouring outlet device and a sleeve adapted to be secured to a mouth and neck portion of a container for liquid and a container closure member releasably securable to the pouring outlet device and/or sleeve;
- (c) disposing the pouring outlet device, sleeve and container closure member at least partly within the

outer sleeve member;

(d) forming the outer sleeve member into a first outer sleeve and a separate second outer sleeve.

This method is particularly advantageous in mass  
5 production.

Preferably step (d) is carried out using a first cutting tool such as a blade of a machine tool.

Preferably step (d) comprises:

forming a cut around a portion of the outer sleeve  
10 member so as to form adjacent first and second circumferential edges on the first and second outer sleeves.

Advantageously, the first and second edges are formed in a groove carried on the container closure member.

Advantageously the first and second circumferential  
15 edges are of reduced diameter compared to at least adjacent portions of the first or second outer sleeve, respectively.

Preferably after step (c) the method also comprises the step of:

(e) forming an end of the first outer sleeve over an  
20 end of the sleeve so as to retain the first outer sleeve and the sleeve in longitudinal relation.

Preferably step (e) is carried out using a second cutting tool such as a further blade of a machine tool.

Steps (d) and (e) may be undertaken substantially  
25 simultaneously.

The closure assembly so formed may comprise a unitary assembly for snap-on application to a mouth and neck portion of a container.

According to a sixth aspect of the present invention  
30 there is provided a method of bottling comprising:

- (a) providing a closure assembly manufactured according to the first aspect of the invention;
- (b) providing a bottle;
- (c) filling the bottle with a liquid;

- (d) closing the bottle by applying the closure assembly to a mouth and neck of the bottle.

#### BRIEF DESCRIPTION OF DRAWINGS

5        An embodiment of the present invention will now be described by way of example only, and with reference to the accompanying drawings, which are:

10       Figure 1(a)       a cross-sectional side view a closure assembly according to an embodiment of the present invention prior to initial opening;

15       Figure 1(b)       a perspective view from a side and first end of a first body part and lock means of the closure assembly of Figure 1(a) prior to initial opening;

20       Figure 1(c)       an exploded perspective view of the closure assembly of Figure 1(a);

25       Figure 2(a)       a cross-sectional side view of the closure assembly of Figure 1(a) after initial opening with a container closure member removed;

30       Figure 2(b)       a perspective view from a side and a first end of the first body part and lock means of the closure assembly of Figure 1(a) after initial opening;

      Figure 3        a cross-sectional side view of the closure assembly of Figure 1(a) after reclosure;

      Figure 4        a cross-sectional side view a closure

assembly falling outwith the scope of the present invention during an initial step of manufacture;

- 5     Figure 5            a cross-sectional side view of the closure assembly of Figure 4 during an intermediate step of manufacture;
- 10     Figure 6            a cross-sectional side view of the closure assembly of Figure 4 after manufacture and prior to initial opening;
- 15     Figure 7            an exploded perspective view from a side and above of the closure assembly of Figure 6 in combination with a bottle having a neck and mouth; and
- 20     Figure 8            a cross-sectioned side view of the closure assembly of Figure 6 applied to the bottle of Figure 7 prior to initial opening.

#### DETAILED DESCRIPTION OF DRAWINGS

Referring to Figures 1(a) to 3, there is shown a closure assembly (or tamper-evident device), generally designated 5, according to an embodiment of the present invention. The closure assembly 5 is adapted to be applied to a mouth and neck portion of a container for liquid (not shown). The closure assembly 5 comprises: a first body part 10; a first tamper-evidence member or lock or lockable means 15; and a container closure member 20, wherein prior to initial opening the lock means 15 is in a first position such that the first body part 10 and the container closure member 20 are disposed in a first relation to one another, and initial opening of the closure assembly 5 causes the

lock means 15 to move to a second (fixed) position.

The Applicant has named the closure assembly of the present invention the "ALUSNAP" (Trade Mark) closure assembly, tamper-evident device, snap-on fitment or non-  
5 refillable device.

Upon reclosure of the closure assembly 5 the lock means 15 causes the first body part 10 and the container closure member 20 to be disposed in a second relation to one another. In this way a clear indication is given to a  
10 person that the closure assembly 5 has been opened and reclosed. The lock means 15 therefore provides a first visual tamper-evidence means 16 (see Figure 3).

The lock means 15 comprises a lock member 25. The lock member 25 comprises a lock body portion 30 having a  
15 first flanged end 35. Also the lock body portion 30 has a second flanged end 40.

The first flanged end 35 and an inner side of the container closure member 20 are provided with co-acting engagement means. By such arrangement in an initially  
20 unopened disposition the container closure member 20 and lock member 25 are held together, and an initial opening action of the container closure member 20 causes the lock member 25 to move from said first to said second position.

The co-acting engagement means comprise a resiliently  
25 flexible male member 45 provided on the inner side of the container closure member 20 and a female member 50 provided at the first end 35 of the lock member 25. Once the lock member 25 is in said second position, further opening action (whether initial or reopening) causes the male  
30 member 45 to release from the female member 50.

The closure assembly 5 provides a tubular body 55 having open first and second ends 60,65, the first end 60 having a plurality of circumferentially spaced teeth 70.

The assembly 5 includes a pouring outlet device 75

including a pouring lip 80, the tubular body 55 being provided within the pouring outlet device 75.

The teeth 70 are resiliently flexible - that is to say, have "memory", i.e. when flexed, return to their original position.

In said initially unopened position, said flanged first end 35 of said lock member 25 is within said tubular body 55, and an initial opening operation of said container closure member 20 causes said flanged first end 35 of said lock member 25 to move passed said teeth 70 by elastic deformation of the teeth 70, and out of said first end 35 of said tubular member 55. The teeth 70 therefore act as non-return means or "barbs" by which said flanged first end 35 of said lock member 30 is prevented from re-entering said tubular member 55.

As can be seen from Figure 2(a), in said second position, the second flanged end 40 of the lock body portion 30 abuts a flange 85 provided on the second end 65 of the tubular body 55.

The lock body portion 30 carries biasing means 90, which tend to bias the lock member 25 towards said first position. As can be seen from Figure 1(a), said second flanged end 40 of said lock body portion 30 substantially seals or closes a mouth of a container (not shown) when in said first position and said closure assembly 5 is applied to a container.

In this embodiment the bias means 90 may comprise one or more sprung arms 105 extending from said lock body portion 30 towards said second end 40 thereof. Thus, if a counterfeiter seeks to remove or removes at least part of the lock member 25 by cutting off flanged end 40, the lock member 25 returns to its initial position and the container is sealed against outflow and/or refilling.

The closure assembly 5 may comprise a snap-on fitment,

and includes means to prevent refilling as hereinafter described.

The teeth 70 may each extend from the tubular body 55 and comprise an angled portion 110 and a substantially  
5 longitudinally extending end portion 115.

It will be appreciated that the first body part 10, lock means 15 and container closure member 20 can be made from suitable plastics materials.

From the foregoing, one will appreciate that the  
10 closure assembly 5 provides:

- (a) first visual tamper-evident means 160;
- (b) means, i.e. biased lock member 25, to prevent outflow or refilling if or when the first tamper-evident member is at least partially removed.

15 In a modification to the closure assembly 5, there are provided second tamper-evident means substantially similar to the tamper-evident means of the closure assembly 205 of Figures 4 to 8, as hereinafter described, the closure assembly 205 *per se* falling outwith the scope of the  
20 present invention. Further, the closure assembly 5 may be manufactured in a similar manner to the closure assembly 205, as hereinafter described. The closure assembly 5 shares many common parts with the closure assembly 205, like parts being identified by like numerals, but suffixed  
25 "'". Indeed in the modification, the closure assembly 5 can have all of the parts of the closure assembly 205, but additionally is provided with the lock means 15.

Thus referring now to Figures 6, 7 and 8, there is shown a closure assembly (or tamper-evident device),  
30 generally designated 205', falling outwith the scope of the present invention, but incorporating a tamper-evident means which may be included in the closure assembly 5 according to an embodiment of the invention as a second tamper-evident means.

The closure assembly 5' is adapted to be applied to a mouth and neck portion 210', 211' of a container or bottle 215' for liquid. The closure assembly 5' comprises a sleeve 220' adapted to lie substantially concentrically with respect to mouth 210' and provided with means for fixing the sleeve 220' on the container 215'. The closure assembly 5' further comprises a first outer sleeve 225' being a substantially tight interference fit with the sleeve 220' but rotatable with respect thereto upon application of sufficient rotational force. The closure assembly 5' also comprises a second outer sleeve 230' separate from the first outer sleeve and associated with a container closure member 235'. Prior to initial opening, between the first and second outer sleeves 225', 230' there is provided a circumferentially extending cut line 231' formed as will hereinafter be described. The cut line 231' extends 360° around the closure assembly 5 and separates the first and second outer sleeve 225', 230'. The cut line 231' may be unperceivable or at least almost unperceivable by the naked eye. There are also provided means for spacing apart initially adjacent portions of the first and second outer sleeves 225', 230' upon reclosure of the closure assembly 5' after an initial opening of the container 215, as will hereinafter be described in greater detail, which spacing means comprise tamper-evident means.

The first outer sleeve 225' has open first and second ends 240', 245', and the second outer sleeve has a first closed ends 250' and a second open end 255'.

The cap 235' includes a circumferential groove 260', and further provides a circumferential lip portion 265' located below and adjacent to the circumferential groove 260'.

The initially adjacent portions comprise initially adjacent respective circumferential edges 270', 275' of the

first and second outer sleeves 225',230'. The first and second circumferential edges 270',275' are prior to initial opening located in the circumferential groove and are substantially adjacent one another.

5        During an initial container opening operation, the first circumferential edge 270' expands or rides over the circumferential lip portion 265' and then recoils or retracts to substantially its original circumferential position so as to become positioned radially behind the  
10 circumferential lip portion 265'. Alternatively or additionally during an initial container opening operation, the circumferential lip portion 265' contracts or rides under the first circumferential edge 270' and then recoils or expands to substantially its original circumferential  
15 position so as to become positioned radially ahead of the first circumferential edge 270'. This action or these actions position the circumferential lip portion 265' longitudinally between the first and second circumferential edges 270',275' in an obstructive manner such that when the  
20 container 215' is reclosed by re-applying the closure member 235', the first and second outer sleeves 225',230' are spaced apart by the circumferential lip portion 265' located therebetween.

By this arrangement after reclosure the first and  
25 second circumferential edges 270',275' are no longer adjacent but spaced thus revealing a void or gap substantially comprising groove 260' and lip portion 265' between the first and second circumferential edges 270',275'. This visual indicator evidences that the closure  
30 assembly 5' (and container 215') has been opened and reclosed and therefore provides tamper-evident means. Similar means may be provided in the closure assembly 5 of Figure 1.

The first circumferential edge 270' of the first outer

sleeve 225' can in a modification provide a first circumferential beaded portion on the first outer sleeve 225' adjacent first circumferential edge 270', and in a same manner the second circumferential edge 275' of the  
5 second outer sleeve 230' can provide a second circumferential beaded portion on the second outer sleeve 230' adjacent second circumferential edge 275'.

The first and second sleeves 225', 230' are made from any suitable material, e.g. a metal or metallic based  
10 material. In this case the metal substantially comprises aluminium or an alloy thereof, e.g. rolled aluminium. Aluminium provides a good medium for application of printing dyes, inks, paints or the like such that messages, logos, images, names, and/or other information can be  
15 carried by the first and second outer sleeves 225', 230'.

The cap 235' includes an internally threaded portion 285' which co-acts with an external thread 286' on sleeve 220' and allows for a rotational movement (normally anti-clockwise) of the cap 235' during a container opening  
20 operation, and a contra-rotational movement (normally clockwise) of the cap 325' during a container closing operation.

The closure assembly 5' includes a non-refillable device 290' providing a pouring outlet device 295' adapted  
25 to be secured to the mouth 10 of the container 215' for liquid. The container closure member 235' is adapted to close an outlet 300' of the pouring outlet device 295', the first outer sleeve 225' optionally being located to receive at least part of the pouring outlet device 295'. The  
30 outlet 300' is substantially annular and the cap 235' carries on an inner facing end 305' an annular seal 310 removably receivable within the annular outlet 300'. The annular outlet 300' defines a circumferential pouring lip 301'.

The second outer sleeve 330' is adapted to receive the cap 235'. The cap 235' is generally received in a tight interference fit to the second outer sleeve 230', but may be rotatable with respect to the second outer sleeve 235' upon application of sufficient force. For example, upon reclosure of the closure assembly 5, when circumferential lip portion 265' abuts first circumferential edge 270' further reclosure movement (e.g. clockwise turning of second outer sleeve 225') can cause closure member 235' to remain stationery and outer sleeve 225' to rotate relative thereto. Further, the second circumferential edge 275' maintains the second outer sleeve 230' in longitudinal relation with the closure member 235'.

The pouring outlet device 295' is, in this embodiment, made in one piece with the sleeve 220', e.g. by injection moulding.

The non-refillable device 290' further comprises a valve seat body 315' which is at least partially receivable within at least part of the neck portion 211' of the container 215', the valve seat body 315' being at least partially surrounded by the sleeve 220'. First and second moveable valve members 335', 336' are provided within the valve seat body 315'. The second valve 336' comprises a spherical body, while the first valve member 335' comprises a finned tubular body having a downwardly directed closed frustonical lower end and an open upper end which receives the second valve member 336'.

A non-return valve is formed from the valve seat body 315' and valve members 335', 336' which is closed in a normally upright position of the bottle 215', and which while allowing liquids to flow from the bottle 215' in a pouring operation, restricts in-flow of liquid into the bottle 215' by rudimentary unauthorised filling operations or even more sophisticated methods, which may involve

attempted insertion of objects, tubes or the like into the bottle mouth 210'.

There are also provided on the closure assembly 5, 5' means for retaining the first outer sleeve 225' in longitudinal relation to the sleeve 220', e.g. an end 226' of the first outer sleeve 225' formed (bent) over an end 220' of the sleeve 220'.

The first and second circumferential edges 270', 275' of the first and second outer sleeves 270', 275' are before an initial opening of the closure assembly 5' located within the circumferential groove 260' provided on the cap 235', and are substantially adjacent. This positioning ensures that when the container 215' is initially opened by relative twisting of the cap 235' and sleeve 220', the second circumferential edge 275' of the second outer sleeve 230' remains within the groove 260' provided on the cap 235', and the first circumferential edge 270' of the first outer sleeve 225' progressively resiliently can be caused to move circumferentially outward and out of the groove 260' provided on the cap 235' as the cap 235' is removed away from the pouring outlet device 295' and the first outer sleeve 225' portion. Alternatively or additionally as mentioned above, the circumferential lip portion 265' may progressively resiliently move circumferentially inward. On removing the contact between the cap 235' and the first circumferential edge 270' of the first outer sleeve 225', the first circumferential edge 270' retracts to a substantially reduced circumference (e.g. its original circumference), such that the resulting circumference is less than that of a cap portion which is located below the groove 260', e.g. circumferential lip portion 265'.

When the cap 235' is re-applied to the pouring outlet device 295', a stop position is reached when the circumferential lip portion 265' of the cap 235' rests,

sits or abuts upon the first circumferential edge 270' of the first outer sleeve 225', thus preventing the cap 235 being returned to its original starting (unopened) position. A longitudinal gap or void (not shown) therefore  
5 remains between the first and second outer sleeves 225', 230' thus exposing a circumferential part of the cap 235', which includes at least part of the circumferential lip portion 265' which was originally encased or enclosed within the first outer sleeve 225'. A further void (not  
10 shown) also exists between a lower edge of the cap 235' and an original cap 235' seating surface 320' of the pouring outlet device 295'.

Advantageously the exposed circumferential part of the cap 235' may be distinctly coloured and/or printed with  
15 information, promotional messages or the like.

There are provided means for fixing the closure assembly 5,5' on the bottle 215'. The fixing means comprise first means 325' for fixing the sleeve 220' on the container 215' so as to restrain rotational movement of the  
20 sleeve 220' with respect to the neck portion 211' of the container 215'.

The fixing means also comprise second means 330' for fixing the sleeve 220' on the container 215' so as to restrict longitudinal movement of the sleeve 220' with  
25 respect to the mouth 210' of the container 215'. The second means 330' for fixing the sleeve 220' are in the form of at least one projecting means 330' inwardly of said sleeve 220', said at least one projecting means 330' being moveable radially of the sleeve 230' in a stiffly resilient  
30 manner and being engagable with an outer lip portion 212' of said container 215'.

The first outer sleeve 225' fits with the sleeve 220' by means of an interference fit between an outer surface 340' of the sleeve 220' and an inner surface 345' of the

first outer sleeve 225'. The cap 235' has therein threaded portion 285', which engages with a corresponding threaded portion 286' (350') on the pouring outlet device 295'.

It is desired that the first and second outer sleeves 225', 230' are aesthetically pleasing, and as such, the first and second outer sleeves 225', 230' comprise metal foil.

There are provided means 346' for assembling the sleeve 220' and valve seat body 315' together prior to application to the container 215', such as co-acting ribs and grooves carried by each.

The projecting means 330' are provided on an inner wall 215' of the sleeve 220' to resiliently engage the neck portion 211' and outer lip portion 212' of the container 215'.

The sleeve 220' contains one or more circumferential apertures 315' around the sleeve 220', which are defined between axially extending portions of the sleeve 220'. The/each projecting means 330' are provided adjacent to an edge of one of the apertures 315'.

As can be seen in this closure assembly, each projecting means 330' is positioned on a lower circumferential edge 360' of one of the apertures 315'.

The sleeve 220' further carries a tubular body 365' (comprising the tubular body 55 of Figure 1) positioned inwardly and substantially concentrically of the pouring outlet device 295'. The tubular body 365' is attached to an inner portion 370' of the sleeve 220' or pouring outlet device 295' via a plurality of webs 375'. In closure assembly 5', a bore 380' of the tubular body 365' is closed by an outer facing wall 385' as the closure assembly 5' is not provided with a lock means. The closed wall 385' of said tubular body 365' is positioned to be substantially flush with the circumferential pouring lip 301'.

The tubular body 365' is provided with a circumferentially extending brim 390' which is positioned on the lower outer edge 395' of said tubular body 365'. Conveniently the webs 375' connect an inner tubular 400' of the sleeve 220' to the brim 390' and to the tubular body 365'. Each web 375' is configured to provide a bracket upon which the brim 390' fixedly sits.

The sleeve 220' is further conveniently provided with a plurality of ribs (or ridges) 405' formed on an inner surface 410' thereof, in this embodiment arranged circumferentially around the sleeve 220' and having their long axes arranged substantially axially to said sleeve 220'. These ribs 405', in use, form the first means 325' for fixing against anti-rotation and co-act with raised pips, ridges or the like 213', on an outer surface of the container 215' (comprising a so-called "glass finish" of the bottle) to seek to prevent undesired rotational movement of the sleeve 220'.

Some minor rotational play in either a clockwise or anticlockwise direction may occur until a stop position is found by a rib or ribs 405' acting against a ridge or ridges 213'. However, continued application of force will cause the first outer sleeve 235' and/or the second outer sleeve 230' to rotate relative to the sleeve 220' and/or cap 235', respectively.

The valve seat body 315' comprises a tubular portion 410', a free end portion 415' of which provides a valve seat 420' adapted to be contacted in a sealing manner by first valve member 335' captive in the tubular portion 410'. The valve seat 420' comprises a circumferentially extending flange 421', which extends radially inwardly of the tubular portion 410'. In this case the valve seat 420' is positioned at one end of the tubular portion 410', and that end of the tubular portion 410' is closed except for a

circular aperture 425'

The tubular portion 410' is adapted to be received substantially within the mouth 210' portion of the container 215'. The tubular portion 410' further comprises  
5 at least one engagement means 430' on an outer surface 235' thereof to engage an inner surface 440' of the container 215' in an interference fashion. The engagement means 430' comprise radially extending circumferential ribs.

At or near to an end of the tubular portion 410'  
10 distant from the valve seat 420' is provided a substantially concentric further tubular body 445' of greater diameter than the tubular portion 410', and an inner surface 446' of the further tubular body 445' is connected to an outer surface 455' of the tubular portion  
15 410' by one or more further webs 460'. Further, a first end 465' of the further tubular body 445' is connected to an outer surface 455' of the tubular portion 410' by an annular flange 475'. Such construction provides a circumferential trough 480' defined between the outer  
20 surface 470' of the tubular portion 410' and the inner surface 450' of the further tubular body 475' with the flange 475' forming a trough floor. The trough 480' is divided into smaller arc-shaped troughs 485' by the further webs 460'. Such a trough 480' or troughs 485' help prevent  
25 insertion of objects into the container 215' through the closure assembly 5'.

A second end 490' of the further tubular body 445' is arranged substantially flush with an end 495' of the tubular portion 410' distant from the valve seat 420'.

30 In use, the tubular portion 410' forms an inner sleeve of the assembled closure assembly 5'.

An outer surface 500' of the further tubular body 445' interference interacts with an inner surface 305 of the sleeve 420'. Conveniently, a radially extending

circumferential rim 510' is located on an outer edge 515' of an end of the further tubular body 445', which, in an assembled closure assembly 5' is seated against a lower surface of a radially inwardly extending circumferential rim 425' provided on an inner surface of the sleeve 220'.

The container 215' is typically a container for liquid. The container 215' is most likely a bottle, e.g. a glass bottle, suitable for containment of liquid, such as alcoholic drinks or beverages, e.g. spirits such as vodka, whisky, brandy, gin or the like.

Typically, the bottle 215' is made from glass or alternatively a plastics material, the first and second outer sleeves 225', 230' from aluminium, the cap 235' from low density polyethylene, the sleeve 230' and pouring outlet 295' from a stiffly resilient plastics material such as polypropylene or polystyrene and which in this case is a polystyrene obtainable under the trade name, STYROLUX, the valve member 235' from crystal polystyrene and the valve seat body 315' from low density polyethylene.

Referring now to Figures 4 to 7, there is illustrated a method of manufacturing the closure assembly 5, 5'. The method comprises the steps of:

- (a) providing an outer sleeve member 224, 224' (Figure 4);
- (b) providing pouring outlet device 295, 295' and sleeve 220, 220' adapted to be secured to mouth and/or neck portion 210', 211' of container 215' for liquid, and container closure member 235, 235' releasably securable to the pouring outlet device 295, 295' and/or sleeve 220, 220' (Figure 4);
- (c) disposing the pouring outlet device 295, 295', sleeve 220, 220' and container closure member 235, 235' at least partly within the outer sleeve member 224, 224' (Figure 5);

(d) forming the outer sleeve member 224' into first outer sleeve 225,225' and separate second outer sleeve 230,230' (Figure 6).

This method is particularly advantageous in mass  
5 production. Step (d) is carried out using a first cutting tool such as a blade of a machine tool (not shown).

Step (d) comprises: forming a cut around a portion of the outer sleeve member 224,224' so as to form the adjacent first and second circumferential edges 270',275' on the  
10 first and second outer sleeves 225',230'. In this way the blade forms cut line 231,231' hereinbefore mentioned.

As can be seen from Figure 4, where provided, the first and second circumferential edges 270',275 are formed in circumferential groove 260' carried on the container  
15 closure member 235'. Also as can be seen, the first and second circumferential edges 270',275' are of reduced diameter compared to at least adjacent portions of the first or second outer sleeves 225',230' respectively.

After step (c) the method also comprises the step of:  
20 (e) forming end 226,226' of the first outer sleeve 225,225' over end 320,320' of the sleeve 220,220' so as to retain the first outer sleeve 225,225' and the sleeve 220,220' in longitudinal relation.

Step (e) is carried out using a second cutting tool  
25 such as a further blade (not shown) of the machine tool. Steps (d) and (e) are beneficially undertaken substantially simultaneously, e.g. for reasons of speed of manufacture.

The closure assembly 5,5' formed by this method comprises a unitary assembly for snap-on application to a  
30 mouth and neck portion 210',211' of a container 215'.

A method of bottling according to the present invention comprises:

- (a) providing closure assembly 5;
- (b) providing a bottle;

- (c) filling the bottle with a liquid;
- (d) closing the bottle by applying the closure assembly 5 to a mouth and neck portion of the bottle.

5        It will be understood that the embodiment of the present invention hereinbefore described is given by way of non-limiting example only, and that modifications may be made without departing from the scope of the present invention. For example, the outer sleeve member may be  
10 applied to various different designs of pouring device adapted to be applied to a variety of containers including bottles.

      In a modification, the second outer sleeve and/or the first outer sleeve may include knurled or castellated  
15 surfaces to assist in gripping in opening and reopening and/or closing and reclosing of the closure assembly.

      It will further be appreciated that the present invention provides a particularly desirable one-piece snap-on fitment having functional advantages over the prior art as well as  
20 enhanced aesthetic appeal.

      Finally, it will be appreciated that in the disclosed embodiment of the closure assembly of the present invention prior to an initial opening, the first and second circumferential edges of the first and second outer sleeves  
25 are substantially adjacent one another and may indeed even abut. However, advantageously they are not connected together, e.g. by any frangible or weakened break-line, frangible or weakened links or frangible and/or removable tear ring, but rather are distinct and separate one from  
30 the other. It will be understood, however, that in a less preferred implementation one or more frangible links may be provided between the first and second circumferential edges which links break or tear or shear upon initial opening.

CLAIMS

1. A closure assembly adapted to be applied to a mouth  
and neck portion of a container for liquid, the assembly  
5 comprising:

a first body part,  
a tamper-evidence member or lock means, and  
a container closure member,

wherein prior to initial opening the tamper-evidence  
10 member or lock means is in a first position such that the  
first body part and the container closure member are  
disposed in a first relation to one another, and initial  
opening of the closure assembly causes the tamper-evidence  
member or lock means to move to a second position.

15

2. A closure assembly as claimed in claim 1, wherein upon  
reclosure of the closure assembly the lock means causes the  
first body part and the container closure member to be  
disposed in a second relation to one another.

20

3. A closure assembly as claimed in either of claims 1 or  
2, wherein the lock means provides a first visual tamper-  
evidence means.

25

4. A closure assembly as claimed in any preceding claim,  
wherein the lock means comprises a lock member retained  
within the first body part, the lock member comprising a  
lock body portion having a first flanged end and a second  
flanged end.

30

5. A closure assembly as claimed in claim 4, wherein the  
first flanged end and an inner side of the container  
closure member are provided with co-acting engagement means  
such that in an initially unopened disposition the

container closure member and lock member are held together, and an initial opening action of the container closure member causes the lock member to move in a longitudinal direction from said first position to said second position.

5

6. A closure assembly as claimed in claim 5, wherein the co-acting engagement means comprises a resiliently flexible male member provided on the inner side of the container closure member and a female member provided at the first  
10 end of the lock member.

7. A closure assembly as claimed in claim 6, wherein, in use, once the lock member is in said second position, further opening action causes the male member to release  
15 from the female member.

8. A closure assembly as claimed in any preceding claim, wherein the first body part provides a tubular body having open first and second ends, the first end having a  
20 plurality of circumferentially spaced teeth.

9. A closure assembly as claimed in claim 8, wherein the assembly includes a pouring outlet device including a pouring lip, the tubular body being provided within the  
25 pouring outlet device.

10. A closure assembly as claimed in either of claims 8 or 9, wherein said teeth are resiliently flexible.

30 11. A closure assembly as claimed in claim 8 when dependent upon claim 3, wherein in said initially unopened position, said flanged first end of said lock member is within said tubular body, and an initial opening operation of said container closure member causes said flanged first

end of said lock member to move passed said teeth and out of said first end of said tubular member.

12. A closure assembly as claimed in either of claims 3 or 5 11, wherein in said second position, the second flanged end of the lock body portion abuts a flange provide on the second end of the tubular body.

13. A closure assembly as claimed in claim 3 or claims 11 10 or 12, wherein the lock body portion carries biasing means, which tend to bias the lock member towards said first position.

14. A closure assembly as claimed in claim 3 or any of 15 claims 11 or 13, wherein said second flanged end of said lock body portion substantially seals or closes a mouth of a container when in said first position and said closure assembly is applied to a container.

20 15. A closure assembly as claimed in claim 13, wherein the bias means comprises one or more sprung arms extending from said lock body portion towards said second end thereof.

25 16. A closure assembly as claimed in any preceding claim, wherein the closure assembly comprises a snap-on fitment.

17. A closure assembly as claimed in any preceding claim, wherein the closure assembly includes means to prevent refilling.

30

18. A closure assembly as claimed in claim 8, wherein the teeth each extend from the tubular body and comprise an angled portion and a substantially longitudinally extending end portion.

19. A closure assembly as claimed in any preceding claim, wherein the first body part, lock member and container closure member are made from at least one plastics materials.

5

20. A closure assembly as claimed in any preceding claim, wherein the first body part comprises a sleeve adapted to lie substantially concentrically with respect to the mouth and provided with means for fixing the sleeve on the  
10 container, the closure assembly further comprising a first outer sleeve being a substantially tight fit with the sleeve but rotatable with respect thereto, and a second outer sleeve separate from the first outer sleeve and associated with the container closure member, and wherein  
15 there are provided means for spacing apart initially adjacent portions of the first and second outer sleeves upon reclosure of the assembly after an initial opening of the container.

20 21. A closure assembly as claimed in claim 20, wherein the spacing means provide a second visual tamper-evidence means.

22. A closure assembly as claimed in either of claims 20  
25 or 21, wherein the first outer sleeve has open first and second ends and the second outer sleeve has a first closed end and second open end.

23. A closure assembly as claimed in any of claims 20 to  
30 22, wherein the container closure member includes a circumferential groove and a circumferential lip portion located below and adjacent to the circumferential groove.

24. A closure assembly as claimed in any of claims 20 to 23, wherein the initially adjacent portions comprises adjacent respective circumferential edges of the first and second outer sleeves.

5

25. A closure assembly as claimed in claim 24 when dependent upon claim 23, wherein prior to opening the first and second circumferential edges are located in the circumferential groove and are adjacent one another.

10

26. A closure assembly as claimed in claim 25, wherein during an initial container opening operation, the first circumferential edge expands or rides over the circumferential lip portion and then recoils or retracts, optionally to substantially its original circumferential position, so as to become positioned circumferentially behind the circumferential lip portion.

27. A closure assembly as claimed in either of claims 25 or 26, wherein during an initial container opening operation, the circumferential lip portion contracts or rides under the first circumferential edge and then recoils or expands, optionally to substantially its original circumferential position, so as to become positioned circumferentially ahead of the first circumferential edge.

28. A closure assembly as claimed in either of claims 26 or 27, wherein upon reclosure the circumferential lip is positioned longitudinally between the first and second circumferential edges in an obstructive manner such that when the container is reclosed by re-applying the closure member, the first and second outer sleeves are spaced apart at least by the circumferential lip portion located therebetween.

29. A closure assembly as claimed in claim 24 when dependent upon claim 3 or claim 21, wherein the first and/or optionally second tamper-evidence means provide that after reclosure the first and second circumferential edges are no longer adjacent but spaced, thus revealing at least one void or gap between the first and second circumferential edges, thus providing a visual indicator evidencing that the closure assembly and container has been opened and reclosed.

10

30. A closure assembly as claimed in claim 24, wherein the first circumferential edge of the first outer sleeve provides a circumferential first beaded portion on the first outer sleeve, and the second circumferential edge of the second outer sleeve provides a circumferential second beaded portion on the second outer sleeve.

31. A closure assembly as claimed in claim 20 or any of claims 21 to 30 when dependent upon claim 20, wherein the first and second sleeves comprise a metal or metallic based material.

32. A closure assembly as claimed in claim 31, wherein the metal or metallic based material substantially comprises aluminium or an alloy thereof such as rolled aluminium.

33. A closure assembly as claimed in claim 32, wherein printing dyes, inks or paints in the form of messages, logos, images, names, and/or other information carried by the first and/or second outer sleeves.

34. A closure assembly as claimed in any preceding claim, wherein the container closure member is a cap which includes a threaded portion which allows a rotational

movement of the cap during a container opening operation.

35. A closure assembly as claimed in any preceding claim, wherein the closure assembly includes a non-refillable  
5 device adapted to be secured to the mouth of a container for liquid.

36. A closure assembly as claimed in claim 20 when  
dependent upon claim 9, wherein the container closure  
10 member is a cap adapted to close an outlet of the pouring outlet device, and the first outer sleeve is adapted to receive at least part of the pouring outlet device, the outlet being substantially annular and the cap carrying on  
an inner facing end an annular seal removably receivable  
15 within the annular outlet.

37. A closure assembly as claimed in claim 34 when  
dependent upon claim 20, wherein the second outer sleeve  
member is adapted to receive at least part of the cap.  
20

38. A closure assembly as claimed in claim 37, wherein the cap is generally received in a tight interference fit to the second outer sleeve but is optionally rotatable with respect to the second outer sleeve upon application of  
25 sufficient force.

39. A closure assembly as claimed in claim 20 when  
dependent upon claim 9, wherein the pouring outlet device is made in one piece with the sleeve.  
30

40. A closure assembly as claimed in claim 35 when  
dependent upon claim 20, wherein the non-refillable device further comprises a valve seat body which is at least partially receivable within at least part of the neck

portion of the container, and wherein the valve seat body is at least partially surrounded by the sleeve.

41. A closure assembly as claimed in claim 40, wherein at least one moveable valve member is provided within the valve seat body.

42. A closure assembly as claimed in claim 20, wherein there are provided means for retaining the first outer sleeve in longitudinal relation to the sleeve, comprising an end of the first outer sleeve at least partially formed over an end of the sleeve.

43. A closure assembly as claimed in claim 25, wherein the first and second circumferential edges of the first and second sleeves are before an initial opening of the closure assembly located within the circumferential groove provided on the closure member, and are substantially adjacent, such that when the container is initially opened by relative twisting of the closure member and sleeve, the second circumferential edge of the second outer sleeve remains within the groove provided on the closure member, and the first circumferential edge of the first outer sleeve progressively resiliently is caused to move circumferentially outward and out of the groove provided on the closure member as the closure member is removed away from the pouring outlet device and the first portion, and/or the circumferential lip portion is progressively caused to move circumferentially inward, on removing the contact between the closure member and the first circumferential edge of the first outer sleeve, the first circumferential edge retracts to a substantially reduced circumference, such that the resulting circumference is less than that of a portion of the closure member which is

located below the groove.

44. A closure assembly as claimed in claim 43, wherein the portion of the closure member comprises the circumferential lip on the closure member.

45. A closure assembly as claimed in claim 44 when dependent upon claim 9, wherein when the closure member is re-applied to the pouring outlet device, a stop position is reached when the circumferential lip portion of the closure member rests, sits or abuts upon the first circumferential edge of the first outer sleeve, thus preventing the closure member being returned to its original unopened starting position, a longitudinal gap or void remaining between the first and second outer sleeves thus exposing a circumferential part of the closure member, which part includes at least part of the circumferential lip which was originally encased or enclosed within the first circumferential edge and an original cap seating surface of the pouring device.

46. A closure assembly as claimed in claim 45, wherein the exposed circumferential part of the closure member is distinctly coloured and/or printed with information and/or promotional messages.

47. A closure assembly as claimed in claim 20, wherein the fixing means comprise first means for fixing the sleeve on the container so as to restrain rotational movement of the sleeve with respect to the neck portion of the container.

48. A closure assembly as claimed in claim 47, wherein the fixing means also comprise second means for fixing the sleeve on the container so as to restrict longitudinal

movement of the sleeve with respect to the mouth of the container.

49. A closure assembly as claimed in claim 48, wherein the  
5 second means for fixing the sleeve are in the form of at  
least one projecting means projecting inwardly of said  
sleeve, said at least one projecting means being moveable  
radially of the sleeve in a stiffly resilient manner and  
being engagable with an outer lip portion of said  
10 container.

50. A closure assembly as claimed in claim 20, wherein the  
first outer sleeve fits with the sleeve by means of an  
interference fit between an outer surface of the sleeve and  
15 an inner surface of the first outer sleeve.

51. A closure assembly as claimed in any preceding claim,  
wherein the closure member has thereon a threaded portion  
which engages with a corresponding threaded portion on the  
20 first body part.

52. A closure assembly as claimed in claim 20, wherein the  
first and second outer sleeves are aesthetically pleasing,  
the first and second outer sleeves comprising metal foil.  
25

53. A closure assembly as claimed in claim 40 when  
dependent upon claim 20, wherein there are provided means  
for assembling the sleeve and valve seat body together  
prior to application to the container.  
30

54. A closure assembly as claimed in claim 49, wherein the  
projecting means are provided on an inner wall of the  
sleeve to resiliently engage the neck portion of the  
container.

55. A closure assembly as claimed in claim 54, wherein the sleeve provides one or more circumferential apertures around the sleeve, which are defined between axially  
5 extending portions of the sleeve, the/each projecting means being provided adjacent to a lower circumferential edge of one of the apertures.

56. A closure assembly as claimed in claim 9, wherein the  
10 pouring outlet device comprises a circumferentially extending pouring lip.

57. A closure assembly as claimed in claim 20 when  
15 dependent upon claim 9, wherein the sleeve is provided with a tubular body positioned inwardly and concentrically of the pouring outlet device, and wherein the tubular body is attached to an inner surface of the sleeve via a plurality of webs.

20 58. A closure assembly as claimed in claim 57, wherein a first end of said tubular body is positioned to be substantially flush with the circumferentially extending pouring lip.

25 59. A closure assembly as claimed in either of claims 57 or 58, wherein said tubular body is provided with a circumferentially extending brim which is positioned on the lower outer edge of said tubular body, the webs connecting an inner surface of the sleeve to the brim and to the  
30 tubular body.

60. A closure assembly as claimed in claim 20, wherein the sleeve is provided with a plurality of ribs or ridges formed on an inner surface thereof, arranged

circumferentially around the sleeve and having their long axes arranged substantially axially to said sleeve, the ribs or ridges, in use, co-acting with raised pips or ridges or the like, on an outer surface of the container to seek to prevent undesired rotational movement of the sleeve.

61. A closure assembly as claimed in claim 40, wherein the valve seat body comprises a tubular portion, a free end portion of which provides a valve seat adapted to be contacted in a sealing manner by a valve member captive in said tubular portion.

62. A closure assembly as claimed in claim 61, wherein the valve seat is a circumferentially extending flange which extends radially inwardly of the tubular portion, the valve seat being positioned at one end of the tubular portion, and that end of the tubular portion being closed except for a circular aperture.

63. A closure assembly as claimed in either of claims 61 or 62, wherein the tubular portion is adapted to be received substantially within the mouth portion of the container, the tubular portion further comprising at least one engagement means on an outer surface thereof to engage an inner surface of the container in an interference fashion, the engagement means comprising radially extending circumferential ribs.

64. A closure assembly as claimed in any of claims 61 to 63, wherein at or near to an end of the tubular portion distal from the valve seat there is provided a substantially concentric further tubular portion of greater diameter than the tubular portion, an inner surface of the

further tubular portion being connected to an outer surface of the tubular portion by one or more further webs.

65. A closure assembly as claimed in claim 64, wherein a first end of the further tubular portion is connected to an outer surface of the tubular portion by an annular flange.

66. A closure assembly as claimed in claim 65, wherein there is provided a circumferential trough defined between the outer surface of the tubular portion and the inner surface of the further tubular portion with the flange forming a trough floor, the trough being divided into smaller arc-shaped troughs by the further webs.

67. A closure assembly as claimed in any of claims 64 to 66, wherein a second end of the further tubular portion is arranged substantially flush with an end of the tubular portion distal from the valve seat.

68. A closure assembly as claimed in claim 57, wherein in use, the tubular portion forms an inner sleeve of the assembled closure assembly.

69. A closure assembly as claimed in any of claims 64 to 68, wherein an outer surface of the further tubular portion interference interacts with an inner surface of the sleeve.

70. A closure assembly as claimed in any of claims 64f to 69, wherein a radially extending circumferential rim is located on an outer edge of an end of the further tubular portion, which in an assembled closure assembly is seated against a lower surface of a radially extending circumferential rim provided on an inner surface of the sleeve.

71. A container including a closure assembly according to any of claims 1 to 70.

5 72. A container as claims in claim 71, wherein the container is a container for liquid.

73. A closure assembly as claimed in either of claims 71 or 72, wherein the container is a bottle, such as a glass  
10 bottle adapted for containment of liquid, such as alcoholic drinks or beverages selected from spirits comprising vodka, whisky, brandy or gin.

74. A combination of a container and a closure assembly  
15 according to any of claims 1 to 70.

75. An alcoholic drinks product comprising an alcoholic substance packaged in the combination according to claim  
20 74.

76. A method of manufacturing a closure assembly according to any of claims 1 to 70 comprising the steps of:

- (a) providing an outer sleeve member;
- (d) providing a pouring outlet device and a sleeve  
25 adapted to be secured to a mouth and neck portion of a container for liquid and a container closure member releasably securable to the pouring outlet device and/or sleeve;
- (e) disposing the pouring outlet device, sleeve and  
30 container closure member at least partly within the outer sleeve member;
- (d) forming the outer sleeve member into a first outer sleeve and a separate second outer sleeve.

77. A method as claimed in claim 76, wherein step (d) is carried out using a first cutting tool comprising a blade of a machine tool.

- 5 78. A method as claimed in either of claims 76 or 77, wherein step (d) comprises:

forming a cut around a portion of the outer sleeve member so as to form adjacent first and second circumferential edges on the first and second outer sleeves.

10

79. A method as claimed in claim 78, wherein the first and second edges are formed in a groove carried on the container closure member.

- 15 80. A method as claimed in either of claims 78 or 79, wherein the first and second circumferential edges are of reduced diameter compared to at least adjacent portions of the first or second outer sleeve, respectively.

- 20 81. A method as claimed in any of claims 76 to 80, wherein after step (c) the method also comprises the step of:

(e) forming an end of the first outer sleeve over an end of the sleeve so as to retain the first outer sleeve and the sleeve in longitudinal relation.

25

82. A method as claimed in claim 81, wherein step (e) is carried out using a second cutting tool comprising a further blade of a machine tool.

- 30 83. A method as claimed in either of claims 81 or 82, wherein steps (d) and (e) are undertaken substantially simultaneously.

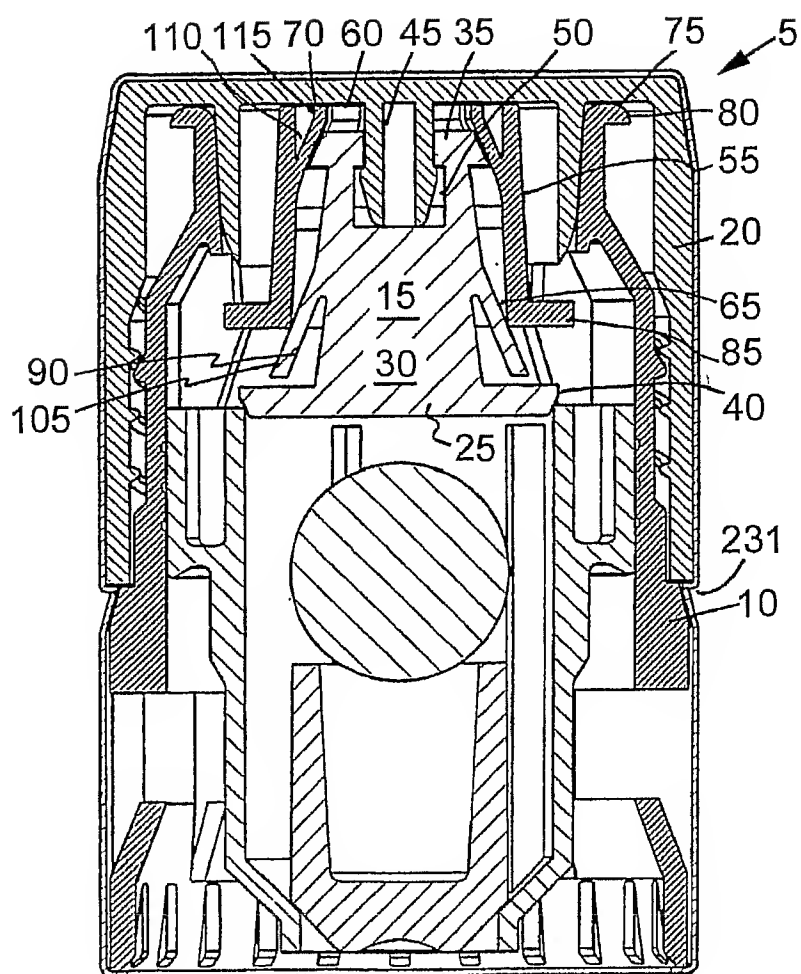
84. A method as claimed in any of claims 76 to 83, wherein the closure assembly so formed comprises a unitary assembly for snap-on application to a mouth and neck portion of a container.

5

85. A method of bottling comprising:

- (a) providing a closure assembly manufactured according to any of claims 1 to 70;
- (b) providing a bottle;
- 10 (c) at least partially filling the bottle with a liquid;
- (d) closing the bottle by applying the closure assembly to a mouth and neck of the bottle.

1/11



BEFORE OPENING

Fig. 1(a)

2/11

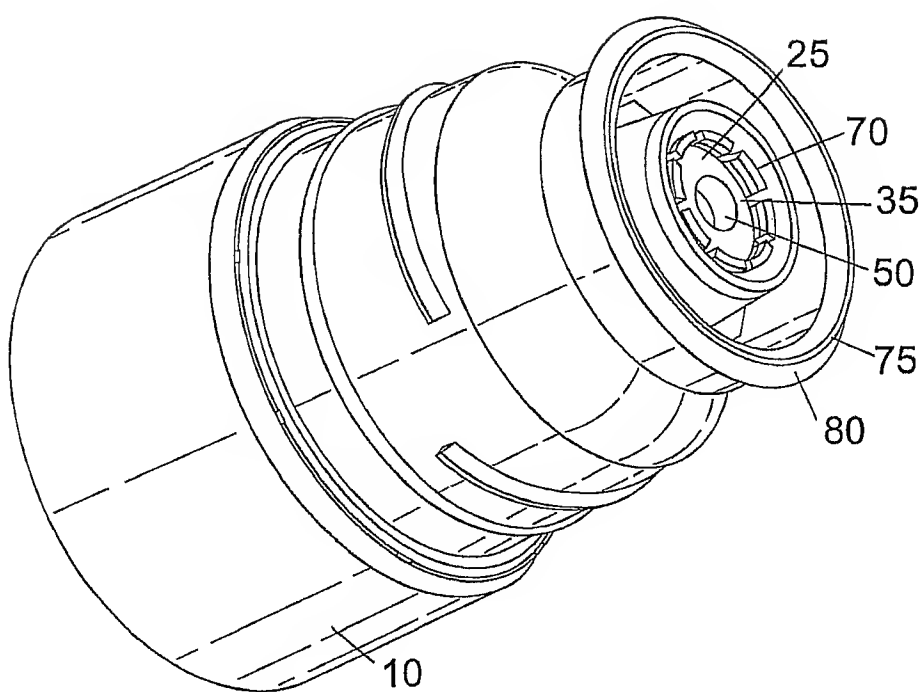


Fig. 1(b)

3/11

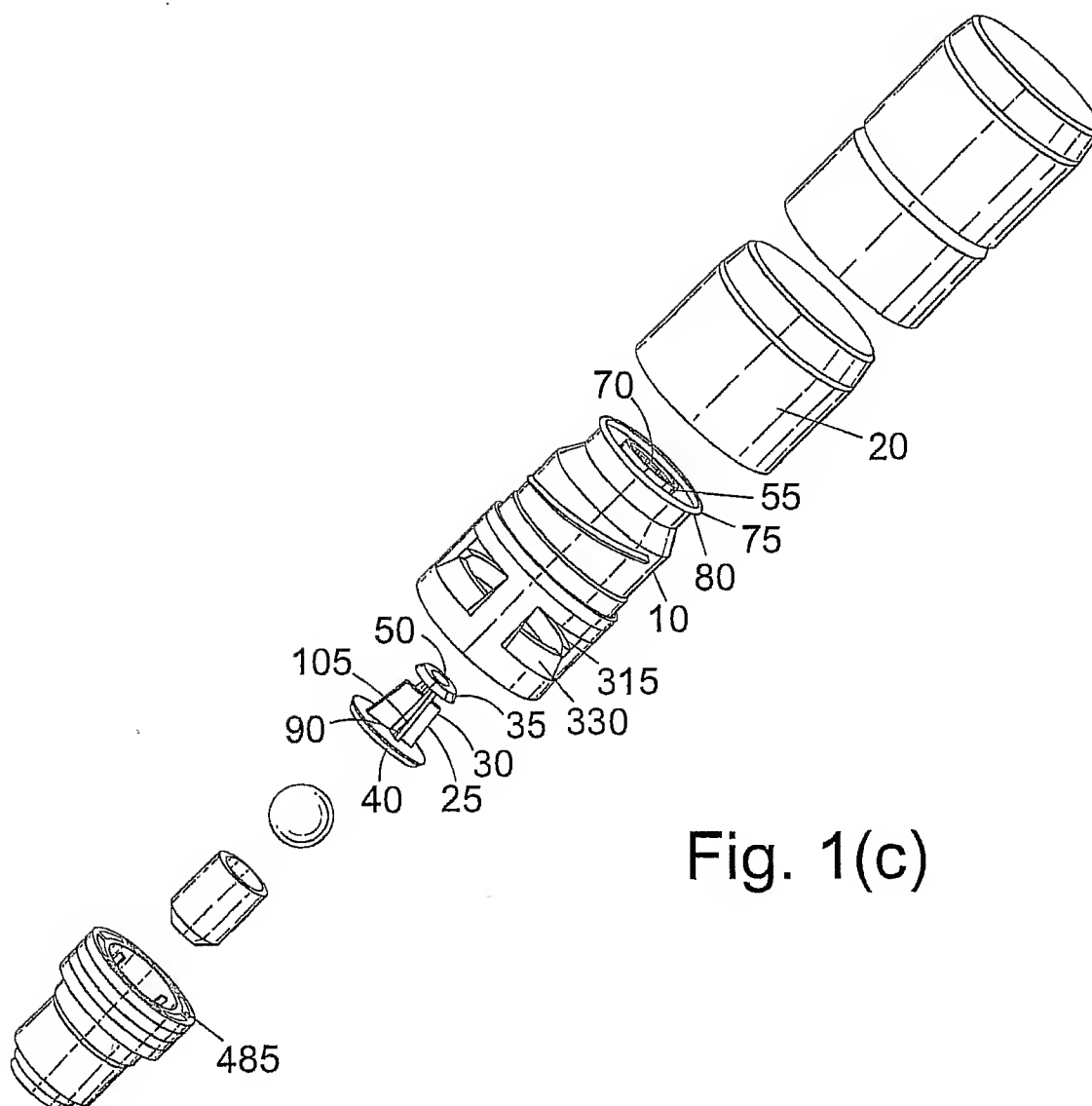
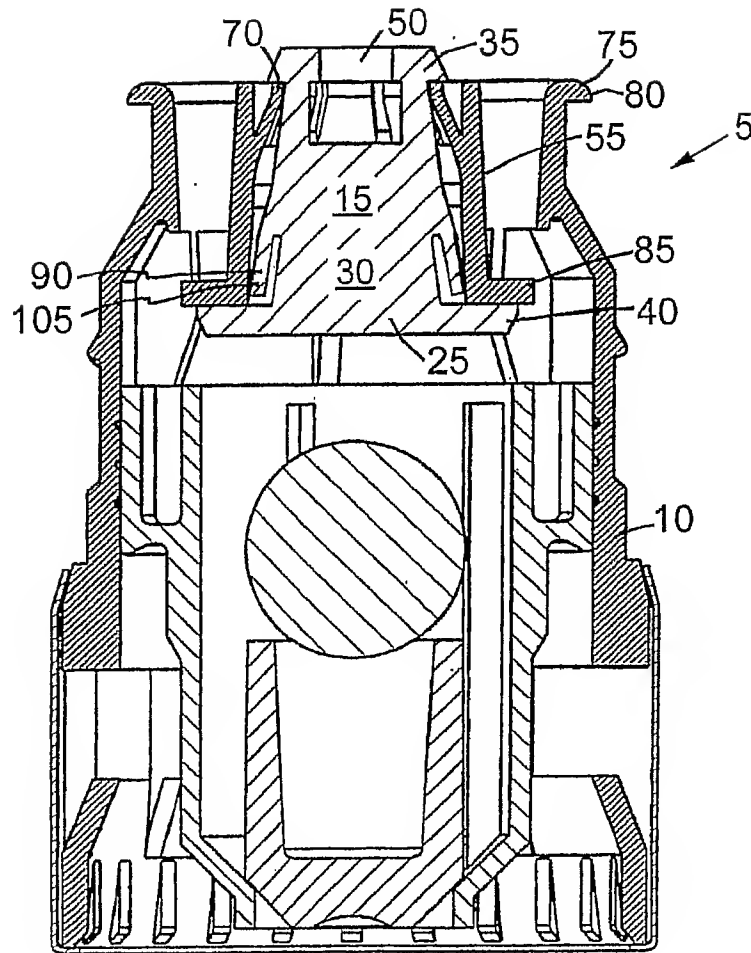


Fig. 1(c)

4/11



AFTER OPENING

Fig. 2(a)

5/11

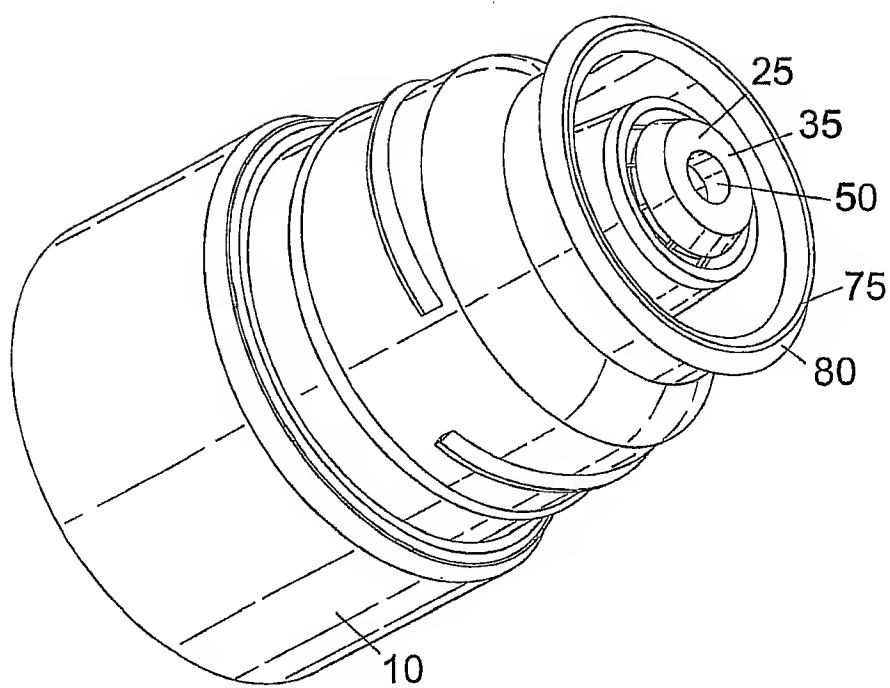
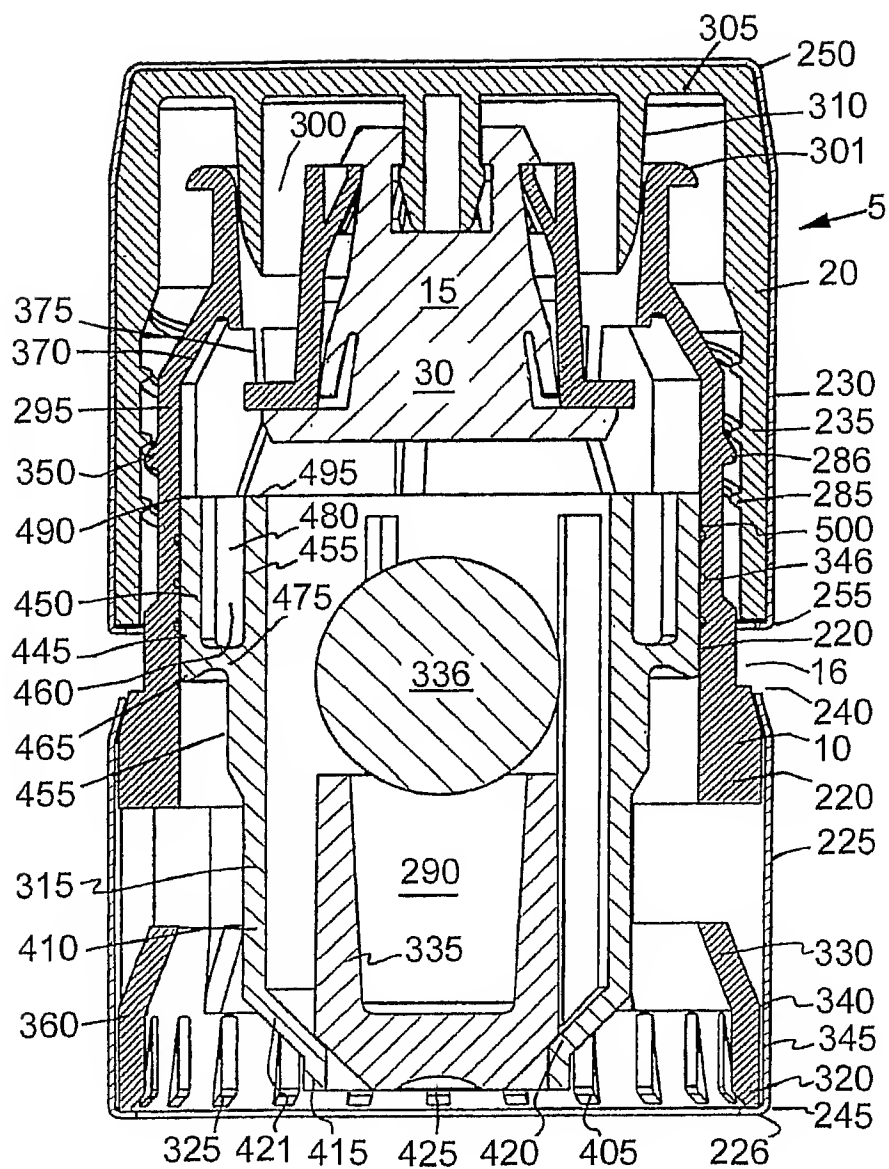


Fig. 2(b)

6/11



RECLOSED AFTER OPENING

Fig. 3

7/11

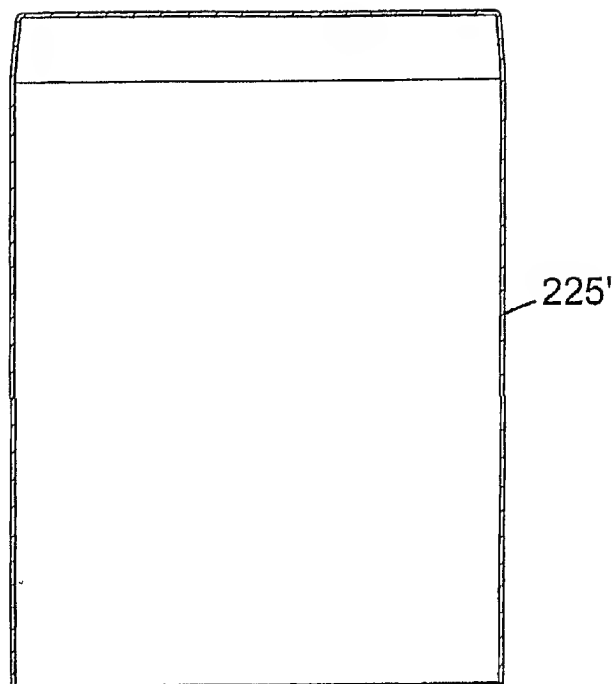
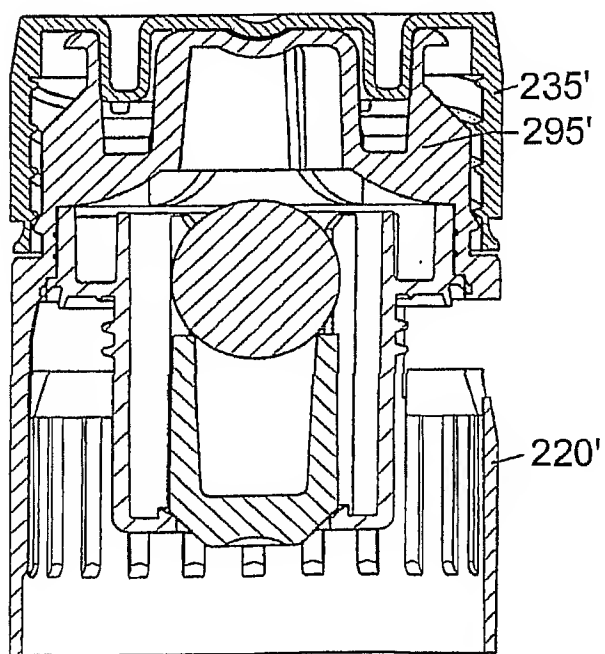


Fig. 4



8/11

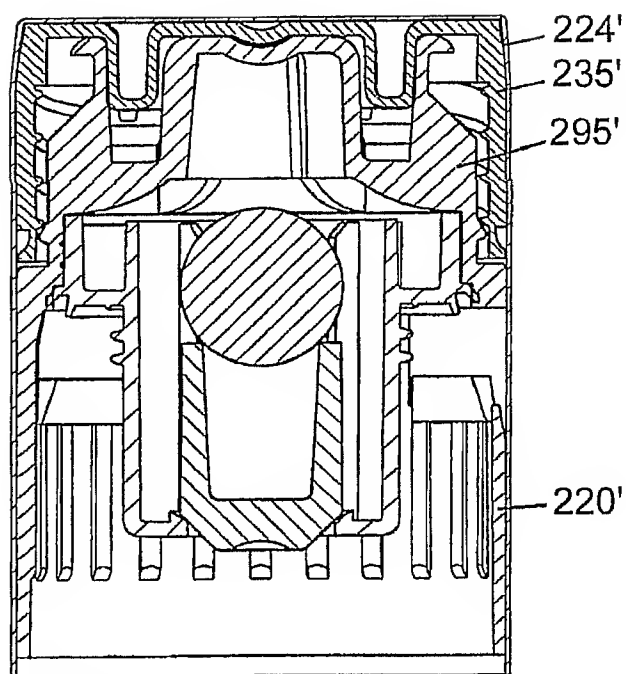


Fig. 5

9/11

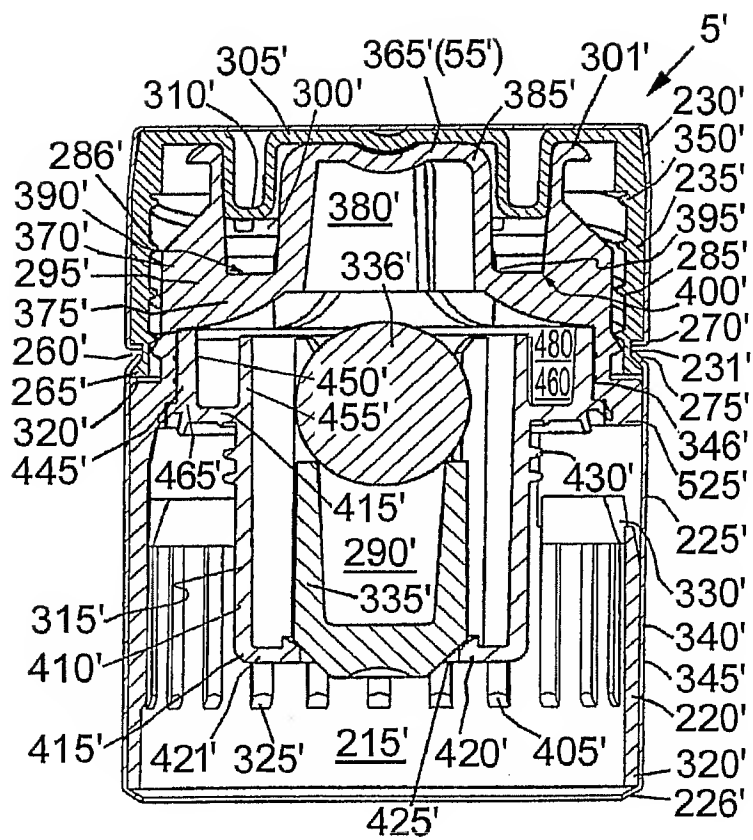
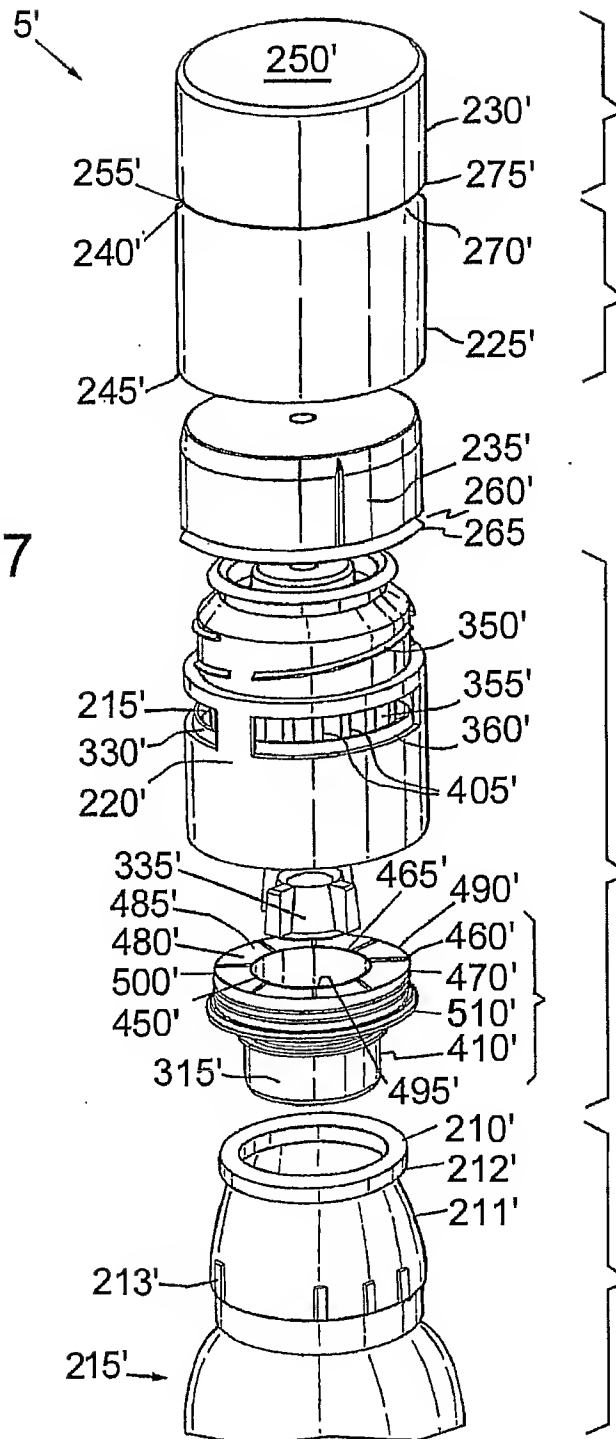


Fig. 6

10/11

Fig. 7



11/11

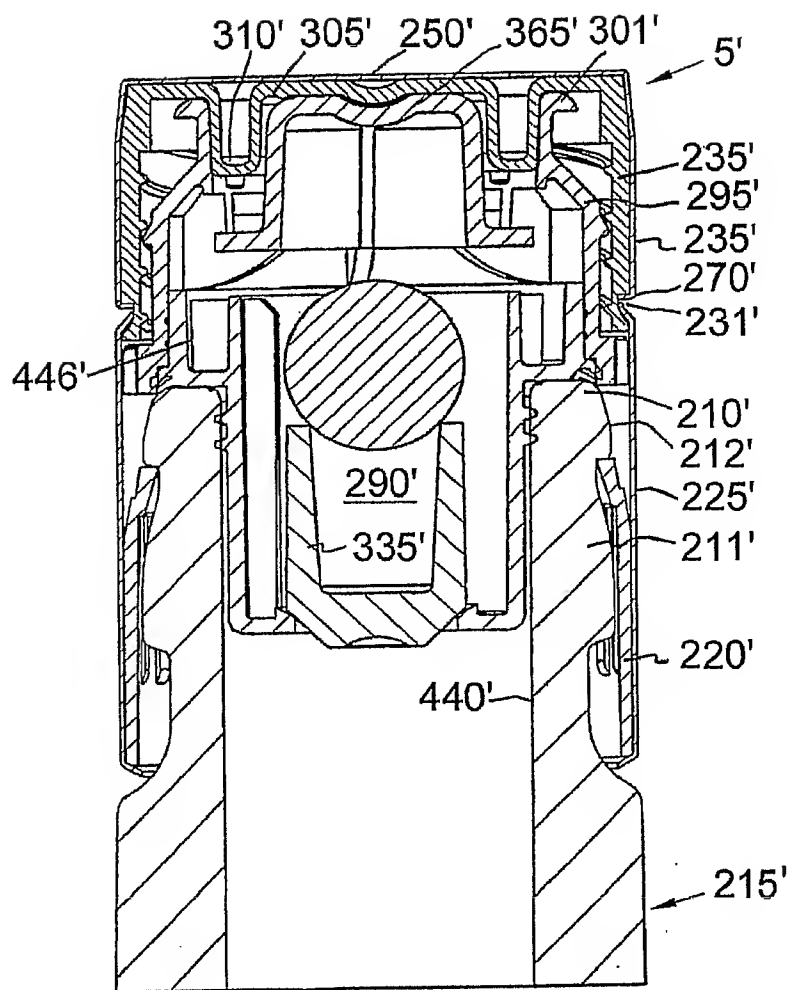


Fig. 8

(19)



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**EP 1 161 382 B1**

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(54) **WATER SOLUBLE PACKAGE**

WASSERLÖSLICHE VERPACKUNG

EMBALLAGE HYDROSOLUBLE

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**US-A- 4 973 416**

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**EP1 161 382B1**

**Description**

[0001] The invention relates to a water soluble package containing a fluid substance for release on dissolution of the package.

[0002] Detergent compositions for the machine washing of laundry are provided in many forms. Probably the most prevalent form of laundry detergent is washing powder or granules. A problem with the use of these forms of detergent is that the product needs to be dosed into the machine in such a way that the detergent is quickly and thoroughly dissolved in the wash water of the machine without coming into contact with the laundry in a solid form. In this regard many dosing devices which seek to overcome this problem have been proposed. One such device disclosed in European Patent Nos. 0 343 070 and 0 343 069 teaches the use of a flexible fabric sock which holds the particulate detergent in the machine, the fabric of the sock being permeable to water so as to allow water enter the sock and carry the detergent out of the sock through the fabric walls in the form of an aqueous solution. More recently unit dose forms of detergent have been proposed in the form of compressed tablets of detergent powder. A problem encountered with the provision of detergent tablets is that the tablets need to be strong enough to withstand storage and transport, yet weak enough to disintegrate and dissolve quickly in the washing machine. A further problem is the need to prevent the tablets "posting" in the porthole and between the drums of conventional washing machines. More recently these problems have been addressed by the provision of detergent tablets having specific chemical disintegrants which allow quick disintegration of the tablets in the aqueous environment of a washing machine, and by the provision of loosely fitting net bags which aid tablet disintegration and prevent "posting". However, as many of the current detergent tablets contain bleach and other irritant substances, the problem of handling the tablets remains.

[0003] The provision of detergent compositions in water-soluble films has been known for some time. Most of the documents relating to this subject describe water soluble film envelopes formed using a vertical form-fill-seal (VFFS) route. A problem with envelopes produced using this VFFS method is that, due to the constraints of the process, the resultant envelopes have seals which incorporate defined weak points where the seal overlap at corners. This results in envelopes which are easily corrupted as a result of impacts suffered during transport. In an attempt to overcome the problems associated with such VFFS envelopes, European Patent Application No. 0 608 910 describes thermoformed water soluble packages for pesticidal compositions. While this specification attempts to provide a solution to the problem of weak seals, the packages of EP-A-0608910 have other weak points and are designed specifically for containing pesticidal compositions.

[0004] The packaging and transport of water soluble packages containing fluid substances subjects the formed packages to considerable impact forces. A particular problem is that when a number of such packages are loose packed in a larger container which is then transported, the impact forces suffered by the packages within the container can be severe. The difficulty is that in such a situation it only takes one package in the larger container to break for the whole product to be ruined as far as the consumer is concerned because the fluid contents of the broken package may leak over any unbroken packages. Consumer confidence in a product is likely to be badly damaged by such an occurrence.

[0005] The problem of minimising breakage to an acceptable level is particularly acute in the area of laundry detergents and other domestic consumer products and has not been solved until now.

[0006] It is an object of the invention to overcome at least some of the above disadvantages. It is a particular object of the invention to provide a water soluble package containing a fluid substance for release on dissolution of the package, which package has greater rupture resistance compared to known water-soluble packages.

**STATEMENT OF INVENTION**

[0007] According to the invention, there is provided a water soluble package containing a fluid substance for release on dissolution of the package, characterised in that the package has a body portion for containing the substance comprising a first sheet of a water soluble material thermoformed to form a body wall of the body portion, and a second sheet of water soluble material superposed on the first sheet and sealed thereto along a continuous region of the superposed sheets to form a base wall of the body portion, and in that the body portion of the package is generally dome shaped.

[0008] The applicants have surprisingly discovered that the above mentioned problems and disadvantages of prior art water soluble packages are substantially addressed by the packages according to the invention. In particular, the invention yields water soluble packages which are sufficiently robust to withstand (to a commercially acceptable level) the rigours of packaging and transport even when the fluid substance inside the package is a domestic consumer product such as a laundry detergent. The combination of thermoforming the packages of the invention and forming the packages into a dome shape confers surprising advantages on the packages of the invention. It is thought that thermoforming reduces stress on the film during forming compared to other forming techniques. As will be shown below, applicants have found that the dome is a shape which yields greater uniformity of film thickness over the package and greater impact resistance of the package.

[0009] In a preferred embodiment of the invention, the maximum height of the body wall above the base wall is preferably less than or equal to the maximum width of the base wall. The base wall is preferably generally circular but other domeshaped body portions according to the invention are envisaged. For example, domeshapes having rectangular, oval, square and triangular bases are envisaged.

5 Preferably, the base of the domewill be substantially flat. Alternatively, the base may be somewhat concave or convex. In any case the resulting package is aysmmetrical about the base wall, although of course there can be one or more planes of symmetry perpendicular to the base wall.

[0010] The water soluble film, at least of the body wall, is thermoformable and, in one embodiment of the invention, is polyvinyl alcohol, or a polyvinyl alcohol derivative. Preferably the water solublefilm of the base wall is the same material as that used to make the body wall. It is important that the body wall be thermoformed rather than cold formed because applicants have discovered that cold forming stresses the film and weakens the end package as a result.

10 [0011] Preferably, the thermoformed body wall of a package according to the invention is of substantially uniform thickness. By "substantially uniform" it is meant that at any measured point the thickness of the thermoformed film is preferably less than about  $\pm 25\%$ , even more preferably less than about  $\pm 20\%$  and most preferably less than about  $\pm 15\%$ , different from the original thickness of the film pre-thermoforming.

[0012] Preferably the film has a thickness of between 10 and 1000 microns. More preferably the film has a thickness of between 20 and 80 microns, most preferably between 40 and 60 microns.

[0013] In one embodiment of the invention, an exterior surface of the film is treated with BITREX™ to discourage ingestion of the package of the invention by children.

20 [0014] The substance contained within the package may be a liquid, a gel or a paste. If the substance is a liquid then preferably the liquid has a viscosity between 100 and 1000 centipoise, more preferably between 300 and 800 centipoise, even more preferably between 500 and 700 centipoise, and most preferably about 600 centipoise, when measured at  $20^\circ\text{C}$  at  $105\text{s}^{-1}$ . In a preferred embodiment of the invention the substance is present in an amount of between 10 and 500ml, preferably between 10 and 100ml, most preferably between 10 and 50ml. Suitably, the capsule contains between 20 and 30ml of a fluid composition. In a particularly preferred embodiment of the invention the fluid composition is a laundry treatment agent such as a laundry detergent, fabric conditioner or fabric care formulation. However, other compositions for domestic consumer use may be envisaged, such as disinfectants, personal care products, and the like. Preferably the composition is substantially non-aqueous, however the composition may comprise some water, for example between about 1 and about 5% water

30 [0015] The invention also relates to a process for producing a package according to the invention, the process comprising the steps of:

- thermoforming a first sheet of a water soluble material to form a domed body wall of the body portion;
- 35 • placing the fluid substance in the body portion;
- superposing a second sheet of a water soluble material over the first sheet; and
- 40 • heat sealing the first and second sheets along a continuous region of the superposed sheets surrounding the substance to form a base wall of the body portion.

[0016] In one preferred process the first sheet of water-soluble material is thermoformed by means of a heating plate. Preferably, the sheet of water-soluble material intimately contacts the heating plate, typically by applying a vacuum between the heating plate and the sheet of water-soluble material. Generally, the vacuum applied will be of less than 0.6 Bar. Alternatively the sheet may be blown into contact with the heating plate. The thermoforming sheet can be blown or sucked off the heating plate and into a suitable dome-shaped mould. In one aspect of the invention, the process includes an additional step of, prior to the addition of the fluid substance, applying a vacuum to the thermoformed body wall to maintain the shape of the body portion at least until after the heat sealing step.

50 [0017] The invention also relates to a process for the machine washing of laundry by employing a package according to the invention, wherein the fluid substance contained within the package comprises a laundry treatment agent, the process comprising the steps of:

- placing at least one package into the machine along with the laundry to be washed; and
- 55 • carrying out a washing operation.

## Detailed Description of the invention

[0018] The packages of the invention are illustrated with reference to the drawings in which:

- 5        Figures 1a, 1b, 1c and 1d show different views of a first package according to the invention in which the base wall of the body portion is circular.  
       Figures 2a, 2b, 2c and 2d show different views of a second package according to the invention in which the base wall of the body portion is square.  
 10        Figures 3a, 3b, 3c and 3d show different views of a third package according to the invention in which the base wall of the body portion is oval.  
       Figures 4a, 4b, 4c and 4d show different views of a fourth package according to the invention in which the base wall of the body portion is triangular.  
       Figures 5a, 5b, 5c and 5d show different views of a fifth package according to the invention in which the base wall of the body portion is rectangular.

## EXAMPLE

[0019] In this example a thermoforming process is described where a number of packages according to the invention are produced from two sheets of water soluble material. In this regard recesses are formed in the sheet using a forming die having a plurality of cavities with dimensions corresponding generally to the dimensions of the packages to be produced. Further, a single heating plate is used for thermoforming the film for all the cavities, and in the same way a single sealing plate is described.

[0020] A first sheet of polyvinyl alcohol film is drawn over a forming die so that the film is placed over the plurality of forming cavities in the die. Each cavity is generally dome shape having a round edge, the edges of the cavities further being radiussed to remove any sharp edges which might damage the film during the forming or sealing steps of the process. Each cavity further includes a raised surrounding flange. In order to maximise package strength; the film is delivered to the forming die in a crease free form and with minimum tension. In the forming step, the film is heated to 100 to 120°C, preferably approximately 110°C, for up to 5 seconds, preferably approximately 700 micro seconds. A heating plate is used to heat the film, which plate is positioned to superpose the forming die. During this preheating step, a vacuum of 0.5 bar is pulled through the pre-heating plate to ensure intimate contact between the film and the pre-heating plate, this intimate contact ensuring that the film is heated evenly and uniformly (the extent of the vacuum is dependant of the thermoforming conditions and the type of film used, however in the present context a vacuum of less than 0.6 bar was found to be suitable) Non-uniform heating results in a formed package having weak spots. In addition to the vacuum, it is possible to blow air against the film to force it into intimate contact with the preheating plate.

[0021] The thermoformed film is moulded into the cavities blowing the film off the heating plate and/or by sucking the film into the cavities thus forming a plurality of recesses in the film which, once formed, are retained in their thermoformed orientation by the application of a vacuum through the walls of the cavities. This vacuum is maintained at least until the packages are sealed. Once the recesses are formed and held in position by the vacuum, the composition, in this case a non-aqueous liquid detergent is added to each of the recesses. A second sheet of polyvinyl alcohol film is then superposed on the first sheet across the filled recesses and heat-sealed thereto using a sealing plate. In this case the heat sealing plate, which is generally flat, operates at a temperature of about 140 to 160°C, and contacts the films for 1 to 2 seconds and with a force of 8 to 30 kg/cm<sup>2</sup>, preferably 10 to 20 kg/cm<sup>2</sup>. The raised flanges surrounding each cavity ensure that the films are sealed together along the flange to form a continuous seal. The radiussed edge of each cavity is at least partly formed by a resiliently deformable material, such as for example silicone rubber. This results in reduced force being applied at the inner edge of the sealing flange to avoid heat/pressure damage to the film.

[0022] Once sealed, the packages formed are separated from the web of sheet film using cutting means. At this stage it is possible to release the vacuum on the die, and eject the formed packages from the forming die. In this way the packages are formed, filled and sealed while nesting in the forming die. In addition they may be cut while in the forming die as well.

[0023] During the forming, filling and sealing steps of the process, the relative humidity of the atmosphere is controlled to ca. 50% humidity. This is done to maintain the heat sealing characteristics of the film. When handling thinner films, it may be necessary to reduce the relative humidity to ensure that the films have a relatively low degree of plasticisation and are therefore stiffer and easier to handle.

## EXPERIMENTAL DETERMINATION OF OPTIMUM PACKAGE SHAPE

## i) Film Thinning During Thermoforming

[0024] The objective of this experimental work was to create thermoformed packages different shapes from the same material under the same conditions with the same depth of draw and approximately the same volume.

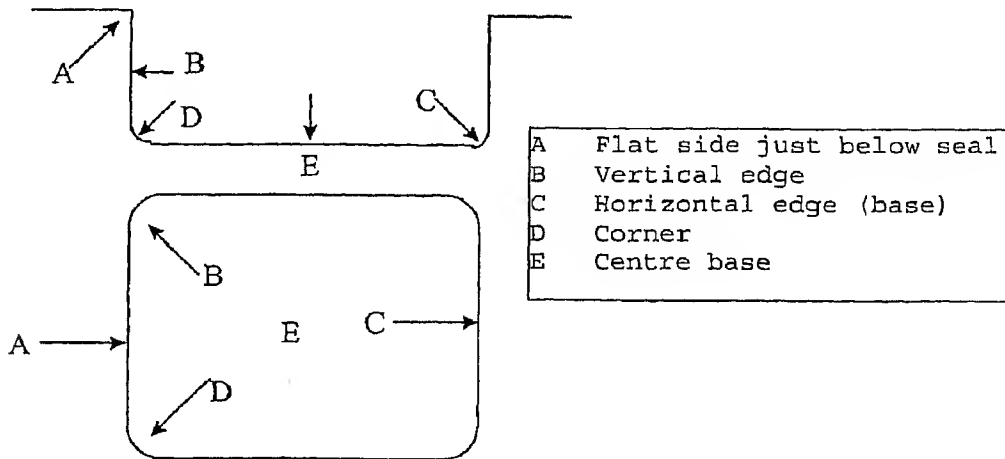
[0025] The formed packages were then tested for thickness at specific points using a micrometer. The results were then compared between shapes,

[0026] The conditions used were:

Film	Polyvinyl alcohol (supplied By Chris Craft under Reference CC8534)
Thickness	75 $\mu$ m
Volume of cavity	Approx. 30ml
Atmospheric condition	17°C, 46% RH
Micrometer sensitivity	5 $\mu$ m

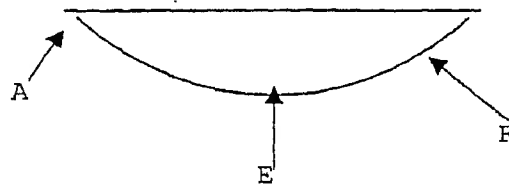
Measurement points

[0027]



[0028] The rectangular shape shown is used only as an example to show the various points.

[0029] For a dome shaped package only points A & E are the same. Points B, C and D are allequivalent in the dome shape and they were represented by Point F below.



[0030] The results were as follows:

EP 1 161 382 B1

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Shape	Sample	Draw Depth	Measurement in microns					
			A	B	C	D	E	F
Dome	1	20mm	60				70	65
	2	"	65				60	65
	3	"	65				60	60
Triangle	1	"	50	50	45	30	65	
	2	"	55	55	40	25	55	
	3	"	55	55	40	25	60	
Dome	4	25mm	60				70	70
	5	"	65				70	70
	6	"	65				65	70
Cube	1	"	55	40	20	15	35	
	2	"	65	35	25	20	35	
	3	"	60	40	25	20	40	

25

[0031] These results show that while thinning always takes place on thermoforming:

- a) for the dome shape thinning is uniform over the test points; and
- b) the dome has a lower level of thinning than the others over the test points.

30

ii) Impact Testing

[0032] The objective of this test was to show any differences, which exist, between the impact resistance of the dome shape and other shapes.

[0033] A falling dart impact test was used.

35

[0034] The test specimen was placed on a hard surface immediately below the suspended dart. The dart was allowed to fall, striking the specimen centrally. The specimen was then examined and any rupture or leak recorded. If there was no rupture or leak, the specimen was subjected to successive impacts, each at a higher dart weight, until rupture did occur.

40

[0035] Three shapes of package were used, all of the same material, fill and approximate weight and size. The test was repeated on both sides of the package (base side up and base side down) and several replicates were tested and a mean taken.

[0036] Before testing all specimens were exposed to the conditions of the test site for 12 hours to reach equilibrium. Test details were:

45

Dart	smooth hemispherical impact surface of 38mm diameter
Drop height	615mm
Surface	Smooth non-resilient plate
Conditions	20°C, 70% RH

50

[0037] Dome, triangle (ie triangular pyramid) and cube shapes were tested.

[0038] Each package was formed from polyvinyl alcohol supplied by Chris Craft under reference CC8534. The film thickness was 75µm.

[0039] Results were as follows:

55

Sample	Shape	Orientation	No. of Drops	Dart Weight to Rupture	Observations
1	Dome	Base Up	3	250g	Small hole mid base

(continued)

Sample	Shape	Orientation	No. of Drops	Dart Weight to Rupture	Observations
2	Triangle	"	2	150g	2 holes in edges
3	Cube	"	2	150g	3 or more holes in corners & edge
4	Dome	Base Down	4	350g	hole in base

[0040] The above results show that the impact resistance of dome is greater than the cube or triangle.

### iii) Secondary Packaging Test

[0041] This experimental test was designed to establish any difference in impact survival between dome shaped packages and triangular packages of a liquid detergent product when multiple packages are contained in fibreboard box [0042] 22 dome-shaped packages according to the invention, containing a liquid laundry detergent, were placed randomly in a fibreboard box. The box was made of "M-flute" material of dimensions 170 x 85 x 54 mm which had a total filled weight of 609g.

[0043] The box was sealed closed and subjected to a vertical drop of 1.2 m on to a hard flat surface on the short dimensions.

[0044] This test was repeated for triangular packages of the same weight and film.

[0045] The results of the test were that 3 out of the 22 dome shaped packages were found to have a small amount of leakage but with the triangular packages, 7 of the 22 were leaking and in 5 cases leakage was very severe.

### Claims

1. A water soluble package containing a fluid substance for release on dissolution of the package, characterised in that the package has a body portion for containing the substance comprising a first sheet of a water soluble material thermoformed to form a body wall of the body portion, and a second sheet of water soluble material superposed on the first sheet and sealed thereto along a continuous region of the superposed sheets to form a base wall of the body portion, and in that the body portion of the package is generally dome shaped.
2. A package according to claim 1, characterised in that the maximum height of the body wall above the base wall is less than or equal to the maximum width of the base wall.
3. A package according to claim 1 or claim 2, characterised in that the base wall is generally circular.
4. A package according to claim 1 or claim 2, characterised in that the base wall is generally oval.
5. A package according to any one of claims 1 to 4, characterised in that the base wall is generally flat, or slightly concave or convex.
6. A package according to any one of claims 1 to 5, characterised in that the first sheet of water-soluble material comprises polyvinyl alcohol or a polyvinyl alcohol derivative.
7. A package according to any one of claims 1 to 6, characterised in that the second sheet of water soluble material comprises polyvinyl alcohol or a polyvinyl alcohol derivative.
8. A package according to any one of claims 1 to 7, characterised in that the fluid substance is a liquid, paste or a gel.
9. A package according to any one of claims 1 to 8, characterised in that the fluid substance is a domestic consumer product.
10. A package according to claim 9, characterised in that the substance is a laundry detergent composition.
11. A process for producing a water soluble package having a body portion containing a fluid substance for release

on dissolution of the package, characterised in that the process comprises the steps of:

- thermoforming a first sheet of a water soluble material to form a domed body wall of the body portion;
  - 5     • placing the fluid substance in the body portion;
  - superposing a second sheet of a water soluble material over the first sheet; and
  - 10    • heat sealing the first and second sheets along a continuous region of the superposed sheets surrounding the substance to form a base wall of the body portion.
12. A process according to claim 11, characterised in that the first sheet of water-soluble material is thermoformed by means of a heating plate.
- 15    13. A process according to claim 11 or claim 12, characterised in that prior to the addition of the substance a vacuum is applied to the thermoformed body wall to maintain the shape of the body portion at least until after the heat sealing step.
- 20    14. A process for the machine washing of laundry by employing a package according to any of claims 1 to 10, characterised in that the fluid substance contained within the package comprises a laundry treatment agent, the process comprising the steps of:
- placing at least one package into the machine along with the laundry to be washed; and
  - 25    • carrying out a washing operation.

#### Patentansprüche

- 30    1. Wasserlösliche Verpackung, enthaltend eine Fluidsubstanz zur Freisetzung bei Auflösung der Verpackung, dadurch gekennzeichnet, dass die Verpackung einen Körperteil zum Enthalten der Substanz aufweist, welcher eine erste Folie aus einem wasserlöslichen Material, die zur Bildung einer Körperwand des Körperteils warmgeformt wird, und eine zweite Folie aus einem wasserlöslichen Material, die auf die erste Folie gelegt und mit dieser entlang eines durchgehenden Bereichs der übereinander gelegten Folien zur Bildung einer Basiswand des Kör-
- 35    pertells versiegelt wird, umfasst, und dass der Körperteil der Verpackung im Allgemeinen kuppelförmig ist.
2. Verpackung nach Anspruch 1, dadurch gekennzeichnet, dass die maximale Höhe der Körperwand oberhalb der Basiswand geringer als oder gleich der maximalen Breite der Basiswand ist.
- 40    3. Verpackung nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, dass die Basiswand im Allgemeinen kreisförmig ist.
4. Verpackung nach Anspruch 1 oder Anspruch 2, dadurch gekennzeichnet, dass die Basiswand im Allgemeinen oval ist.
- 45    5. Verpackung nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, dass die Basiswand im Allgemeinen eben oder leicht konkav oder konvex ist.
6. Verpackung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, dass die erste Folie aus wasserlöslichem Material Polyvinylalkohol oder ein Polyvinylalkoholderivat umfasst.
- 50    7. Verpackung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, dass die zweite Folie aus wasserlöslichem Material Polyvinylalkohol oder ein Polyvinylalkoholderivat umfasst.
- 55    8. Verpackung nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, dass die Fluidsubstanz eine Flüssigkeit, eine Paste oder ein Gel ist.
9. Verpackung nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, dass die Fluidsubstanz ein Haushalts-

verbrauchsprodukt ist.

10. Verpackung nach Anspruch 9, dadurch gekennzeichnet, dass die Substanz eine Wäsche- waschmittelzusammensetzung ist.

11. Verfahren zur Herstellung einer wasserlöslichen Verpackung mit einem Körperteil, der eine Fluidsubstanz zur Freisetzung bei Auflösung der Verpackung enthält, dadurch gekennzeichnet, dass das Verfahren die Schritte umfasst:

- Warmformen einer ersten Folie aus einem wasserlöslichen Material, um eine kuppelförmige Körperwand des Körperteils auszubilden;
- Geben der Fluidsubstanz in den Körperteil;
- Legen einer zweiten Folie aus einem wasserlöslichen Material über die erste Folie; und
- Heißsiegeln der ersten und der zweiten Folie entlang eines durchgehenden Bereichs der übereinander gelegten Folien, die die Substanz umgeben, um eine Basiswand des Körperteils auszubilden.

12. Verfahren nach Anspruch 11, dadurch gekennzeichnet, dass die erste Folie aus wasserlöslichem Material durch eine Heizplatte warmgeformt wird.

13. Verfahren nach Anspruch 11 oder Anspruch 12, dadurch gekennzeichnet, dass vor der Zugabe der Substanz ein Vakuum an die warmgeformte Körperwand angelegt wird, um die Form des Körperteils zumindest bis nach dem Wärmeversiegelungsschritt aufrechtzuerhalten.

14. Verfahren zum Maschinenwaschen von Wäsche durch Verwendung einer Verpackung nach einem der Ansprüche 1 bis 10, dadurch gekennzeichnet, dass die Fluidsubstanz, die innerhalb der Verpackung enthalten ist, ein Wäschebehandlungsmittel umfasst, wobei das Verfahren die Schritte umfasst:

- Legen von mindestens einer Verpackung in die Maschine zusammen mit der zu waschenden Wäsche; und
- Ausführen eines Waschvorgangs.

## Revendications

1. Emballage hydrosoluble contenant une substance fluide pour diffusion au moment de la dissolution de l'emballage, caractérisé en ce que l'emballage a une paroi de corps pour contenir la substance comprenant une première feuille d'un matériau hydrosoluble thermoformée pour former une paroi de corps de la paroi de corps, et une seconde feuille de matériau hydrosoluble superposée à la première feuille et scellée à celle-ci le long d'une zone continue des feuilles superposées pour former une paroi de base de la paroi de corps, et en ce que la paroi de corps de l'emballage a généralement une forme bombée.

2. Emballage selon la revendication 1, caractérisé en ce que la hauteur maximum de la paroi de corps au-dessus de la paroi de base est inférieure ou égale à la largeur maximale de la paroi de base.

3. Emballage selon la revendication 1 ou 2, caractérisé en ce que la paroi de base est généralement circulaire.

4. Emballage selon la revendication 1 ou 2, caractérisé en ce que la paroi de base est généralement ovale.

5. Emballage selon l'une quelconque des revendications 1 à 4, caractérisé en ce que la paroi de base est généralement plate, ou légèrement concave ou convexe.

6. Emballage selon l'une quelconque des revendications 1 à 5, caractérisé en ce que la première feuille de matériau hydrosoluble comprend de l'alcool polyvinylique ou un dérivé d'alcool polyvinylique.

7. Emballage selon l'une quelconque des revendications 1 à 6, caractérisé en ce que la seconde feuille de matériau hydrosoluble comprend de l'alcool polyvinylique ou un dérivé d'alcool polyvinylique.

8. Emballage selon l'une quelconque des revendications 1 à 7, caractérisé en ce que la substance fluide est un liquide, une pâte ou un gel.

## EP 1 161 382 B1

9. Emballage selon l'une quelconque des revendications 1 à 8, caractérisé en ce que la substance fluide est un produit de consommation domestique.
- 5 10. Emballage selon la revendication 9, caractérisé en ce que la substance est une composition de détergent de lessive.
- 10 11. Procédé pour produire un emballage hydrosoluble ayant une partie de corps contenant une substance fluide pour diffusion au moment de la dissolution de l'emballage, caractérisé en ce que le procédé comprend les étapes consistant à :
- thermoformer une première feuille d'un matériau hydrosoluble pour former une paroi bombée de corps de la partie de corps ;
  - placer la substance fluide dans la partie de corps ;
  - superposer une seconde feuille d'un matériau hydrosoluble à la première feuille ; et
  - 15 • thermosceller les première et seconde feuilles le long d'une zone continue des feuilles superposées entourant la substance pour former une paroi de base de la partie de corps.
- 20 12. Procédé selon la revendication 11, caractérisé en ce que la première feuille de matériau hydrosoluble est thermoformée au moyen d'un plateau chauffant.
13. Procédé selon la revendication 11 ou revendication 12, caractérisé en ce qu'avant l'ajout de la substance un vide est appliqué à la paroi de corps thermoformée pour maintenir la forme de la partie de corps au moins jusqu'après l'étape de thermoscellage.
- 25 14. Procédé pour le lavage en machine du linge en employant un emballage selon l'une quelconque des revendications 1 à 10, caractérisé en ce que la substance fluide contenue à l'intérieur de l'emballage comprend un agent de traitement de lessive, le procédé comprenant les étapes consistant à :
- placer au moins un emballage dans la machine en même temps que le linge à laver ; et
  - 30 • réaliser l'opération de lavage.

Fig.1a.

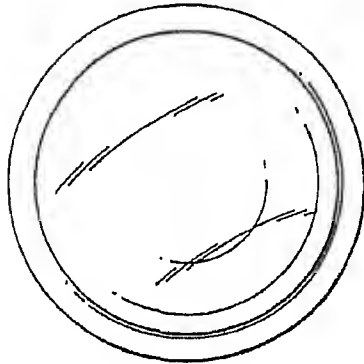


Fig.1b.

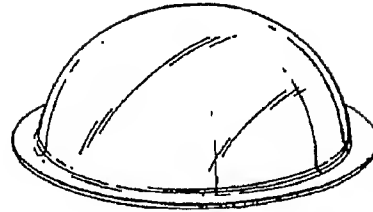


Fig.1c.

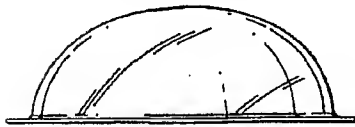


Fig.1d.

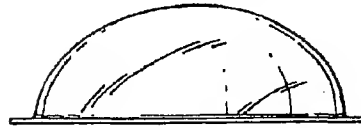


Fig.2a.

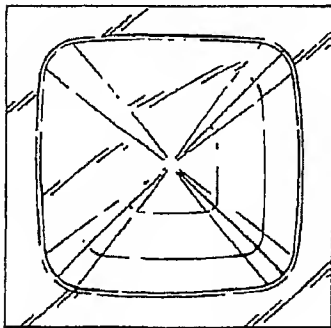


Fig.2b.



Fig.2c.



Fig.2d.

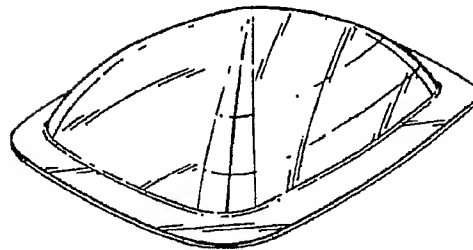


Fig.3a.

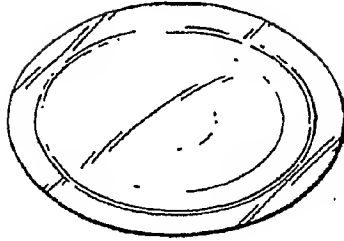


Fig.3b.

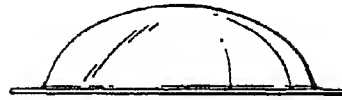


Fig.3c.



Fig.3d.

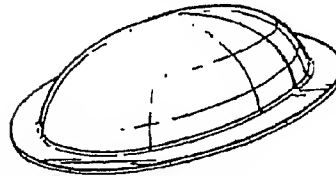


Fig.4a.

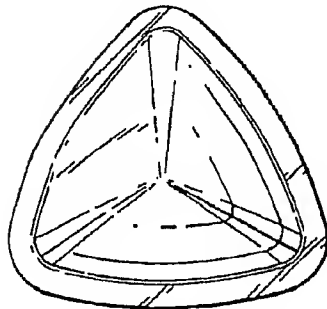


Fig.4b.

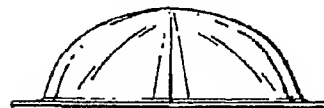


Fig.4d.

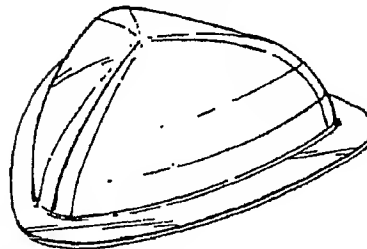


Fig.4c.



Fig.5a.

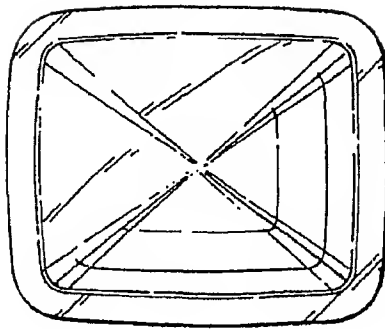


Fig.5b.

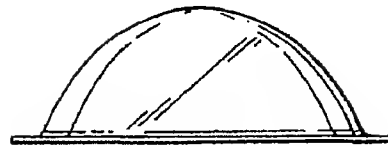


Fig.5d.

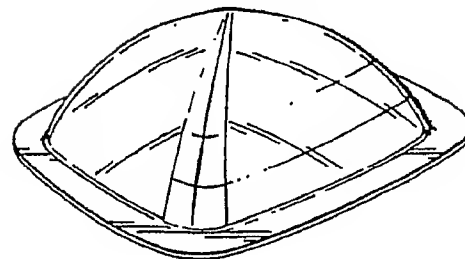


Fig.5c.



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**U1S S1307 S1376 S1427**

(56) Documents Cited

**GB 2358382 A** **FR 002724388 A**  
**US 5224601 A**

(58) Field of Search

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**Online: WPI, EPODOC, JAPIO**

(54) Abstract Title

**Water soluble injection moulded container**

(57) A water-soluble, injection-moulded container comprising a receptacle part and a sealing part which closes the receptacle part, which container encases a fabric care, surface care or dishwashing composition, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part. The container may have two or more compartments and be made of PVA. The receptacle may be sealed to the sealing part by a snap-fit mechanism, adhesive or heat sealed.

**GB 2 375 516**

IMPROVEMENTS IN OR RELATING TO CONTAINERS

The present invention relates to a water-soluble,  
5 injection moulded container and to a process for  
preparing such a container.

It is known to package chemical compositions,  
particularly those which may be of a hazardous or  
10 irritant nature, in films, particularly water soluble  
films. Such containers can simply be added to water in  
order to dissolve or disperse the contents of the  
container into the water.

15 For example, WO 89/12587 discloses a package which  
comprises an envelope of a water soluble material which  
comprises a flexible wall and a water-soluble heat seal.  
The package may contain an organic liquid comprising, for  
example, a pesticide, fungicide, insecticide or  
20 herbicide.

WO 92/17382 discloses a package containing an  
agrochemical comprising a first sheet of non-planar  
water-soluble or water-dispersible material and a second  
25 sheet of water-soluble or water-dispersible material  
superposed on the first sheet and sealed to it.

The above methods of packaging have, however, a number of  
disadvantages.

30

The first disadvantage is that they do not have a  
particularly attractive appearance. In fields such as

containers used in the domestic environment, an attractive appearance for an article is extremely desirable. Liquids contained in envelopes of water-soluble film can have a limp, unattractive appearance.

5

The second disadvantage is that it is difficult to form two or more separate compartments in the packaging such that two or more incompatible components are both enclosed but separated from each other. Although an arrangement has been described to separate incompatible materials in flexible pouches in WO 93/08095, the method proposed is complex and is not currently achievable in large-scale manufacturing. It cannot, therefore, be used for producing large numbers of containers.

15

The third disadvantage is that there is only a limited control of the release profile of the compositions held in the containers. For example, when a composition is held between two planar water-soluble films or in a thermoformed package, the composition is simply released at the time when the films dissolve or disperse in water. While it may be possible to control to a certain extent the timing of the start of release of the contents, there can be no control over the rate of release of the contents since the entire film dissolves or disperses at about the same time. Furthermore it can be difficult to provide an extended time before the contents of the package are released. An additional problem also arises with thermoformed packages. If the thermoforming is not carefully controlled there may be inadvertent thinning of the film material at the points where the film material is drawn down into the mould when it is thermoformed.

30

This could result in release of the contents of the package early. Additionally, in all of the above packages, it is not possible to release different compositions at different times or different rates since,  
5 as discussed above, it is not possible to incorporate more than one composition in each water-soluble container.

The fourth disadvantage is that the containers cannot be  
10 produced at a particularly fast rate. When the containers are produced by heat-sealing planar films or by thermoforming, the containers have to be immediately filled and sealed. All of these procedures have to be carried out in succession. This means that it is not  
15 possible to obtain a quick throughput for mass-market goods such as household products. For example, standard thermoforming machines can only produce about 400 to 800 containers per minute, and vertical form fill sealing machines can only produce about 120 containers per  
20 minute.

It is also desirable to have a container which can be produced in a single process, since this avoids the use of multiple processing steps which may increase the cost  
25 and time taken to produce the final article, as well as reduce the throughput.

The present invention seeks to provide a water-soluble container which overcomes some or all of the above  
30 disadvantages.

The present invention provides a water-soluble, injection-moulded container comprising a receptacle part and a sealing part which closes the receptacle part, which container encases a fabric care, surface care or dishwashing composition, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part.

The containers of the present invention overcome some or all of the above disadvantages.

Firstly, because the containers are generally rigid and self-supporting, they have an attractive, uniform appearance which does not vary between different containers. Furthermore, the containers can easily have various elements incorporated which are considered to be pleasing to the eye but which are impossible to incorporate in the flexible containers discussed above.

Secondly, because the containers are generally rigid, it is possible to introduce two or more compartments, or have larger compartments separated by walls, to separate mutually incompatible ingredients. The containers can also hold part of the composition on an external surface, for example in an indentation. Furthermore the container can be moulded in almost any shape that might be useful. In particular it can be given raised or lowered areas.

Thirdly, it is possible to control the release profile of the contents of the container. Since the container is generally rigid it is possible to adapt the thicknesses of some or all of the walls of the container to control

both the start of release of the composition as well as the rate of release. For example one or more walls of the receptacle part and/or the sealing part may be made thin in order to have an early release of the composition. Alternatively some or all of the walls of the receptacle part and/or the sealing part may be thick in order to ensure that there is a delayed release of the composition. The rate of release of the composition may also be controlled by ensuring that only part of the receptacle part and/or the sealing part of the container has thin walls which are dissolved or dispersed before the remainder of the container. Different walls or parts of walls of the receptacle part and/or the sealing part of the container may be prepared from different water-soluble polymers which have different dissolution characteristics. For example a first component may be fully enclosed by a polymer which dissolves at a higher or lower temperature than the polymer enclosing a second component. Thus different components can be released at different times. If the container holds a composition which does not flow, for example a solid or gelled composition, it is not even necessary for the container to fully enclose the composition. A part may be left exposed so that it immediately begins to dissolve when the container is added to water.

Fourthly, since the containers are generally rigid and self-supporting, they can be easily filled on a production line using normal filling equipment. Such equipment is easily capable of filling at least 1,500 containers per minute.

Fifthly, because the sealing part, or lid, is integrally formed with the receptacle part of the container, there is only one mould which is used. This simplifies the moulding process since the receptacle and sealing parts do not have to be separately formed. This also simplifies the filling process since steps do not need to be taken to provide a separate sealing part immediately after filling to ensure that the contents of the open container are not spilled. These advantages may also contribute to a reduction in cost of production due to the simplified production process. For example only one mould needs to be produced. Injection moulds can often cost up to £100,000 each. Furthermore less material can be used, resulting in a saving of material used and material wasted, as well as a saving of energy used and time taken to change moulds. Additionally savings can be made on storage space and logistics, because it is only necessary to track one component rather than two. Furthermore, since the receptacle part and sealing part are held in a certain spacial relationship, it is a simple matter to seal the receptacle part. Thus the filling and sealing processes are less likely to have the problems associated with the sealing part not properly registering with the receptacle part.

25 An additional advantage is that the sealing part is easily, accurately and consistently sited on onto the receptacle part.

30 Desirably the container, apart from its contents, consists essentially of, or consists of, the injection-moulded polymer composition. It is possible for suitable

additives such as plasticisers, lubricants and colouring agents to be added. Components which modify the properties of the polymer may also be added.

Plasticisers are generally used in an amount of up to 20 wt%, for example from 15 to 20 wt%. Lubricants are generally used in an amount of 0.5 to 5 wt%. The polymer is therefore generally used in an amount of from 75 to 84.5 wt%, based on the total amount of the moulding composition. Suitable plasticisers are, for example, pentaerythritols such as depentaerythritol, sorbitol, mannitol, glycerine and glycols such as glycerol, ethylene glycol and polyethylene glycol. Solids such as talc, stearic acid, magnesium stearate, silicon dioxide, zinc stearate or colloidal silica may also be used.

15

It is also possible to include one or more particulate solids in the moulding composition in order to accelerate the rate of dissolution of the container. This solid may also be present in the contents of the container.

20

Dissolution of the solid in water is sufficient to cause an acceleration in the break-up of the container, particularly if a gas is generated, when the physical agitation caused may, for example, result in the virtually immediate release of the contents from the container.

25

Examples of such solids are alkali and alkaline earth metal, such as sodium, potassium, magnesium and calcium, bicarbonate and carbonate, in conjunction with an acid.

30

Suitable acids are, for example acidic substances having carboxylic or sulfonic acid groups or salts thereof. Examples are cinnamic, tartaric, mandelic, fumaric, maleic, malic, palmoic, citric and naphthalene disulfonic acids, as free acids or as their salts, for example with alkali or alkaline earth metals.

Any water-soluble polymer (which term is taken to include water-dispersible) may be used to form the compartments. Examples of water-soluble polymers are poly(vinyl alcohol) (PVOH), cellulose derivatives such as hydroxypropyl methyl cellulose (HPMC) and gelatin. An example of a preferred PVOH is ethoxylated PVOH. The PVOH may be partially or fully alcoholised or hydrolysed. For example it may be from 40 to 100%, preferably from 70 to 92%, more preferably about 88% or about 92%, alcoholised or hydrolysed. The degree of hydrolysis is known to influence the temperature at which the PVOH starts to dissolve in water. 88% hydrolysis corresponds to a film soluble in cold (ie room temperature) water, whereas 92% hydrolysis corresponds to a film soluble in warm water. A preferred PVOH which is already in a form suitable for injection moulding is sold in the form of granules under the name CP1210T05 by Soltec Developpement SA of Paris, France.

Thus by choosing an appropriate polymer it is possible to ensure that the container dissolves at a desired temperature. Thus it may be cold water (20°C) soluble, but may be insoluble in cold water and only become soluble in warm or hot water having a temperature of, for example, 30°C, 40°C, 50°C or even 60°C.

The walls of the receptacle part and/or the sealing part generally have a thickness such that the container is rigid. For example, the outside walls and any inside  
5 walls of the receptacle part and the sealing part may independently have a thickness of greater than 100 $\mu$ m, for example greater than 150 $\mu$ m or greater than 200 $\mu$ m, 300 $\mu$ m, 400 $\mu$ m, 500 $\mu$ m, 750 $\mu$ m or 1mm. Typically the receptacle part and the sealing part independently have a thickness  
10 of from 200 $\mu$ m to 1,500 $\mu$ m, preferably 300 $\mu$ m to 800 $\mu$ m. If different compartments having different dissolution times are required, different wall thicknesses for each compartment may be used. A thickness difference from 100 $\mu$ m to 500 $\mu$ m, preferably from 250 $\mu$ m to 350 $\mu$ m, would  
15 give a suitable difference in release times.

Preferably the sealing part dissolves in water before they receptacle part. It therefore generally has a wall thickness which is less than the wall thickness of the  
20 receptacle part. In general, the sealing part dissolves in water (at least to the extent of allowing the composition in the receptacle part to be partly or completely dissolved by the water) at 40°C in less than 5 minutes, preferably less than 2 minute.

25

The polymer may be injection moulded at any suitable temperature. A suitable moulding temperature, especially for PVOH, is from 180°C to 220°C, depending upon the formulation selected and the melt flow required.

30

The container may have any shape, but suitably is generally cuboid. The top wall may be formed by the sealing part and the side walls and base wall may be formed by the receptacle part. If the receptacle part or  
5 the sealing part contains two or more compartments, the dividing wall or walls preferably terminate at the top of each part, i.e. in the same plane as the top edges of the side walls, such that when the receptacle part is closed by the sealing part the contents of the compartments  
10 cannot mix.

Either or both of the receptacle part and the sealing part may be formed with an opening, for example a depression, formed in the side wall or in the base wall,  
15 and preferably being open in the outward direction. That is to say, it does not form part of the main volume defined by the container. Preferably the opening is adapted to receive, in a press-fit manner, a solid block, for example a tablet or ball, of a composition useful in  
20 a washing process. The opening may also receive a non-compressed composition, for example a gel, which is allowed to set in the opening. A composition held in such an opening may be released before the contents of the container are released.

25

The receptacle part and the sealing part are joined by a hinge part. All three parts are integrally moulded in the same injection mould. The hinge part is generally a planar portion which is sufficiently thin such that it is  
30 flexible. The hinge part may itself be a single part or have more than the one section, such as 2 or 3 sections, to provide better flexibility. Such an arrangement is

also known as an "active hinge". Generally the thickness of the hinge is from 100 $\mu$ m to 750 $\mu$ m, preferably from 200 $\mu$ m to 500 $\mu$ m.

- 5 The container may be provided with a single sealing part. It is also possible to provide the container with two or more sealing parts, of which at least one, and preferably all, are joined to the receptacle part by a hinge part. For example, if the receptacle part has two or more  
10 compartments, each compartment may be provided with a separate sealing part.

The hinge part may be attached to one or more outer faces of the receptacle part(s) and the sealing part(s) to one  
15 or more inner faces or to one or more edges thereof. In addition any external feature of the hinge present after sealing may optionally be removed by, for example, cutting. This may be carried out for aesthetic reasons.

- 20 Each container may be individually moulded. It is also possible to mould the containers a conjoined line or a two dimensional array. The containers are then filled with the desired composition. Before or after the filling step it is possible, if desired, to separate  
25 individual containers if more than one container has been moulded together. The containers are then sealed by folding the sealing part over the opening of the receptacle part. This may be done, for example, by the use of conveyor system, guide rails and rollers. It is  
30 especially useful to utilise a continuous motion process.

The sealing part may be attached to the receptacle part by any means. For example, a "snap-fit" arrangement may be used. Thus, for example, the receptacle part and the sealing part may have interlocking lugs or pins and  
5 holes. The two parts may also be sealed by means of an adhesive. A suitable adhesive is water or a solution of PVOH. The adhesive can be applied to the lids by spraying, transfer coating, roller coating or otherwise coating, or the lids can be passed through a mist of the  
10 adhesive. The lids can also be made tacky such that they adhere to each other without the need for a separate adhesive. Thus they can be heated, or kept at an elevated temperature such that they adhere to each other when they touch.

15

The parts may also be sealed by heat sealing or infrared, radio frequency, ultrasonic, laser, solvent, vibration, electromagnetic, hot gas, hot plate, insert bonding or friction sealing or by spin welding.  
20 Preferably ultrasonic or laser sealing is used for a short cycle time. The seal desirably is water-soluble.

If heat sealing is used, a suitable sealing temperature is, for example, 120 to 195°C, for example 140 to 150°C.  
25 A suitable sealing pressure is, for example, from 250 to 600 kPa. Examples of sealing pressures are 276 to 552 kPa (40 to 80 p.s.i.), especially 345 to 483 kPa (50 to 70 p.s.i.) or 400 to 800 kPa (4 to 8 bar), especially 500 to 700 kPa (5 to 7 bar) depending on the heat sealing  
30 machine used. Suitable sealing dwell times are at least 0.4 seconds, especially 0.4 to 2.5 seconds.

It is possible for the sealing part and/or the receptacle part itself to have a composition incorporated therein or attached thereto. Thus, for example, the sealing part can be formed with a recess, on the inside or outside face, which is then filled and sealed, for example with a water-soluble film of, for example, PVOH. The sealing part can then be used to seal the receptacle part without the composition falling out of the sealing part.

10

If the containers of the present invention contain two or more compositions, they can have a particularly attractive appearance since the compositions, which may be identical or different, are held in a fixed position in relation to each other. The compositions can be easily differentiated to accentuate their difference. For example, the compositions can have a different physical appearance, or can be coloured differently. Furthermore the containers can be provided with a shape which may be difficult to produce by other methods. For example, by ensuring that the receptacle part and the sealing part each have a hemispherical shape, the final container can be in the form of a sphere.

25 After the container has been formed, the receptacle part is filled with the desired composition(s) which is intended to be released in an aqueous environment.

The composition(s) are independently be a fabric care, surface care or dishwashing composition. Thus, for example, they may be a dishwashing, water-softening, laundry or detergent composition, or a rinse aid. Such

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compositions may be suitable for use in a domestic washing machine. The compositions may also independently be a disinfectant, antibacterial or antiseptic composition, or a refill composition for a trigger-type spray. Such compositions are generally packaged in total amounts of from 5 to 100 g, especially from 15 to 40 g. For example, a laundry composition may weigh from 15 to 40g, a dishwashing composition may weigh from 15 to 30 g and a water-softening composition may weigh from 15 to 40 g.

If the composition is an aqueous liquid having a relatively high water content, for example above 5 wt% water, it may be necessary to take steps to ensure that the liquid does not attack the water-soluble polymer if it is soluble in cold water, or water up to a temperature of, say, 35°C. Steps may be taken to treat the inside surfaces of the container, for example by coating it with agents such as PVdC (poly(vinylidene dichloride)) or PTFE (polytetrafluoroethylene), or to adapt the composition to ensure it does not dissolve the polymer. For example, it has been found that ensuring the composition has a high ionic strength or contains an agent which minimises water loss through the walls of the container will prevent the composition from dissolving the polymer from the inside. This is described in more detail in EP-A-518689 and WO 97/27743.

The compartment(s) may be completely filled or only partially filled. Each composition independently may be a solid. For example, it may be a particulate or granulated solid, or a tablet. Each composition may also

independently be a liquid, which may be thickened or gelled if desired. The liquid composition may be non-aqueous or aqueous, for example comprising less than or more than 5% or less than or more than 10wt% total or  
5 free water. Desirably the compositions contain less than 80 wt% water.

Each composition may have more than one phase. For example each composition may comprise an aqueous  
10 composition and a liquid composition which is immiscible with the aqueous composition. Each composition may also comprise a liquid composition and a separate solid composition, for example in the form of a ball, pill or speckles.

15 Thus the composition within the container, or an individual compartment, need not be uniform. For example, during manufacture the container or compartment could first be fed with a settable composition, for  
20 example, a gel, and then with a different composition. The first composition could dissolve slowly in the washing process so as to deliver its charge over a long period within the washing process. This might be useful, for example, to provide an immediate, delayed or  
25 sustained delivery of an component such as a softening agent.

If more than one composition is present, it is possible to ensure that the compositions are released at different  
30 times. Thus, for instance, one composition can be released immediately the container is added to water, whereas the other may be released later. This may be

achieved by having a compartment which takes longer to dissolve surrounding one or more of the compositions. This may be achieved by using different wall thicknesses for the compartments.

5

The compositions in each compartment may be the same or different. If they are different, they may, nevertheless, have one or more individual components in common.

10

The containers of the present invention may have any desired shape. For example, if the two halves of the container are identical, the container can have a regular geometrical shape such as a sphere, cube, cuboid,

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dodecahedron or cylinder. The cylinder may have any desired cross-section, such as a circular, triangular or square cross-section.

If the two halves of the container are not identical, the container can have a regular or irregular geometrical shape. For example it could have the form of a pyramid, with the sealing part forming the apex and the receptacle part forming the base. It could also have the form of an egg or distorted regular geometrical shape. While the completed container may have a regular geometrical shape, the individual parts may not necessarily be regular or identical. For example, if the final container has a cuboid shape, the individual parts may be in the form of compartments may have different sizes to accommodate different quantities of compositions.

30

The compartments may have the same or different size and/or shape. In general, if it is desired to have compartments containing different quantities of components, the compartments have volume ratios of from 2:1 to 20:1, especially from 4:1 to 10:1. The pairs of compartments may have the same lid size and shape for adhering to each other. Alternatively they may have a different size and/or a different shape. It is preferred that if the compartments have a different size, they have the same shape. In this case the lid of the smaller compartment is adhered to only part of the lid of the larger compartment. Two or more smaller compartments can, if desired, be adhered to the lid of the larger compartment.

15

The container may also have a hook portion so that it can be hung, for example, from an appropriate place inside a dishwashing machine.

20 The containers produced by the process of the present invention may, if desired, have a maximum dimension of 5 cm, excluding any flanges. For example, a container may have a length of 1 to 5 cm, especially 3.5 to 4.5 cm, a width of 1.5 to 3.5 cm, especially 2 to 3 cm, and a  
25 height of 1 to 2 cm, especially 1.25 to 1.75 cm.

If more than one composition is present, the compositions may be appropriately chosen depending on the desired use of the article.

30

If the article is for use in laundry washing, the primary composition may comprise, for example, a detergent, and

the secondary composition may comprise a bleach, stain remover, water-softener, enzyme or fabric conditioner. The article may be adapted to release the compositions at different times during the laundry wash. For example, a  
5 bleach or fabric conditioner is generally released at the end of a wash, and a water-softener is generally released at the start of a wash. An enzyme may be released at the start or the end of a wash.

- 10 If the article is for use as a fabric conditioner, the primary composition may comprise a fabric conditioner and the secondary component may comprise an enzyme which is released before or after the fabric conditioner in a rinse cycle.
- 15 If the article is for use in dish washing the primary composition may comprise a detergent and the secondary composition may comprise a water-softener, salt, enzyme, rinse aid, bleach or bleach activator. The article may be adapted to release the compositions at different times  
20 during the laundry wash. For example, a rinse aid, bleach or bleach activator is generally released at the end of a wash, and a water-softener, salt or enzyme is generally released at the start of a wash. The article may also have more than two compartments adapted to  
25 release compositions at different times. For example a three compartment container may contain a bleach, a bleach activator and an enzyme in different compartments. A four compartment container may also contain a salt in a fourth compartment.

30

Examples of surface care compositions are those used in the field of surface care, for example to clean, treat or

polish a surface. Suitable surfaces are, for example, household surfaces such as worktops, as well as surfaces of sanitary ware, such as sinks, basins and lavatories.

- 5 The ingredients of each composition depend on the use of the composition. Thus, for example, the composition may contain surface active agents such as an anionic, nonionic, cationic, amphoteric or zwitterionic surface active agents or mixtures thereof.

10

Examples of anionic surfactants are straight-chained or branched alkyl sulfates and alkyl polyalkoxylated sulfates, also known as alkyl ether sulfates. Such surfactants may be produced by the sulfation of higher

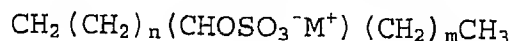
- 15 C<sub>8</sub>-C<sub>20</sub> fatty alcohols.

Examples of primary alkyl sulfate surfactants are those of formula:



- 20 wherein R is a linear C<sub>8</sub>-C<sub>20</sub> hydrocarbyl group and M is a water-solubilising cation. Preferably R is C<sub>10</sub>-C<sub>16</sub> alkyl, for example C<sub>12</sub>-C<sub>14</sub>, and M is alkali metal such as lithium, sodium or potassium.

- Examples of secondary alkyl sulfate surfactants are those  
25 which have the sulfate moiety on a "backbone" of the molecule, for example those of formula:

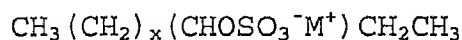


- wherein m and n are independently 2 or more, the sum of m+n typically being 6 to 20, for example 9 to 15, and M  
30 is a water-solubilising cation such as lithium, sodium or potassium.

Epecially preferred secondary alkyl sulfates are the (2,3) alkyl sulfate surfactants of formulae:



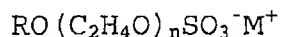
5



for the 2-sulfate and 3-sulfate, respectively. In these formulae x is at least 4, for example 6 to 20, preferably 10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

Examples of alkoxyated alkyl sulfates are ethoxylated alkyl sulfates of the formula:

15



wherein R is a  $\text{C}_8$ - $\text{C}_{20}$  alkyl group, preferably  $\text{C}_{10}$ - $\text{C}_{18}$  such as a  $\text{C}_{12}$ - $\text{C}_{16}$ , n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium, ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric cleaning performance benefits when used in combination with alkyl sulfates.

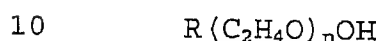
The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

30

Other anionic surfactants which may be employed are salts of fatty acids, for example  $C_8$ - $C_{18}$  fatty acids, especially the sodium or potassium salts, and alkyl, for example  $C_8$ - $C_{18}$ , benzene sulfonates.

5

Examples of nonionic surfactants are fatty acid alkoxyates, such as fatty acid ethoxyates, especially those of formula:



wherein R is a straight or branched  $C_8$ - $C_{16}$  alkyl group, preferably a  $C_9$ - $C_{15}$ , for example  $C_{10}$ - $C_{14}$ , alkyl group and n is at least 1, for example from 1 to 16, preferably 2 to 12, more preferably 3 to 10.

The alkoxyated fatty alcohol nonionic surfactant will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17, more preferably from 6 to 15, most preferably from 10 to 15.

Examples of fatty alcohol ethoxyates are those made from alcohols of 12 to 15 carbon atoms and which contain about 7 moles of ethylene oxide. Such materials are commercially marketed under the trademarks Neodol 25-7 and Neodol 23-6.5 by Shell Chemical Company. Other useful Neodols include Neodol 1-5, an ethoxyated fatty alcohol averaging 11 carbon atoms in its alkyl chain with about 5 moles of ethylene oxide; Neodol 23-9, an ethoxyated primary  $C_{12}$ - $C_{13}$  alcohol having about 9 moles of ethylene oxide; and Neodol 91-10, an ethoxyated  $C_9$ - $C_{11}$  primary alcohol having about 10 moles of ethylene oxide.

Alcohol ethoxylates of this type have also been marketed by Shell Chemical Company under the Dobanol trademark. Dobanol 91-5 is an ethoxylated  $C_9$ - $C_{11}$  fatty alcohol with an average of 5 moles ethylene oxide and Dobanol 25-7 is an ethoxylated  $C_{12}$ - $C_{15}$  fatty alcohol with an average of 7 moles of ethylene oxide per mole of fatty alcohol.

Other examples of suitable ethoxylated alcohol nonionic surfactants include Tergitol 15-S-7 and Tergitol 15-S-9, both of which are linear secondary alcohol ethoxylates available from Union Carbide Corporation. Tergitol 15-S-7 is a mixed ethoxylated product of a  $C_{11}$ - $C_{15}$  linear secondary alkanol with 7 moles of ethylene oxide and Tergitol 15-S-9 is the same but with 9 moles of ethylene oxide.

Other suitable alcohol ethoxylated nonionic surfactants are Neodol 45-11, which is a similar ethylene oxide condensation products of a fatty alcohol having 14-15 carbon atoms and the number of ethylene oxide groups per mole being about 11. Such products are also available from Shell Chemical Company.

Further nonionic surfactants are, for example,  $C_{10}$ - $C_{18}$  alkyl polyglycosides, such as  $C_{12}$ - $C_{16}$  alkyl polyglycosides, especially the polyglucosides. These are especially useful when high foaming compositions are desired. Further surfactants are polyhydroxy fatty acid amides, such as  $C_{10}$ - $C_{18}$  N-(3-methoxypropyl) glycamides and ethylene oxide-propylene oxide block polymers of the Pluronic type.

Examples of cationic surfactants are those of the quaternary ammonium type.

The total content of surfactants in the composition is desirably 0.1 to 95 wt%, especially 60 or 75 to 90 wt%. Desirably, in a laundry composition, an anionic surfactant is present in an amount of 50 to 75 wt%, the nonionic surfactant is present in an amount of 5 to 20 wt%, and/or the cationic surfactant is present in an amount of from 0 to 20 wt%. Desirably, in a dishwashing composition an anionic surfactant is present in an amount of 0.1 to 50 wt%, the non-ionic surfactant is present in an amount of 0.5 to 20 wt%, and/or the cationic surfactant is present in an amount of from 1 to 15 wt%. The amounts are based on the total solids content of the composition, i.e. excluding any solvent which may be present.

The composition, particularly when used as laundry washing or dishwashing composition, may also comprise enzymes, such as protease, lipase, amylase, cellulase and peroxidase enzymes. Such enzymes are commercially available and sold, for example, under the registered trade marks Esperesc, Alcalasc and Savinasc by Nova Industries A/S and Maxatasc by International Biosynthetics, Inc. Desirably the enzymes are present in the composition in an amount of from 0.5 to 3 wt%, especially 1 to 2 wt%.

The composition may, if desired, comprise a thickening agent or gelling agent. Suitable thickeners are polyacrylate polymers such as those sold under the trade

mark CARBOPOL, or the trade mark ACUSOL by Rohm and Hass Company. Other suitable thickeners are xanthan gums. The thickener, if present, is generally present in an amount of from 0.2 to 4 wt%, especially 0.5 to 2 wt%.

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Dishwasher compositions usually comprise a detergency builder. Suitable builders are alkali metal or ammonium phosphates, polyphosphates, phosphonates, polyphosphonates, carbonates, bicarbonates, borates, polyhydroxysulfonates, polyacetates, carboxylates such as citrates, and polycarboxylates. The builder is desirably present in an amount of up to 90 wt%, preferably 15 to 90 wt%, more preferable 15 to 75 wt%, relative to the total weight of the composition. Further details of suitable components are given in, for example, EP-A-694,059, EP-A-518,720 and WO 99/06522.

The compositions can also optionally comprise one or more additional ingredients. These include conventional detergent composition components such as further surfactants, bleaches, bleach enhancing agents, builders, suds boosters or suds suppressors, anti-tarnish and anti-corrosion agents, organic solvents, co-solvents, phase stabilisers, emulsifying agents, preservatives, soil suspending agents, soil release agents, germicides, pH adjusting agents or buffers, non-builder alkalinity sources, chelating agents, clays such as smectite clays, enzyme stabilizers, anti-limescale agents, colourants, dyes, hydrotropes, dye transfer inhibiting agents, brighteners, and perfumes. If used, such optional ingredients will generally constitute no more than 10

wt%, for example from 1 to 6 wt%, the total weight of the compositions.

- The builders counteract the effects of calcium, or other ion, water hardness encountered during laundering or bleaching use of the compositions herein. Examples of such materials are citrate, succinate, malonate, carboxymethyl succinate, carboxylate, polycarboxylate and polyacetyl carboxylate salts, for example with alkali metal or alkaline earth metal cations, or the corresponding free acids. Specific examples are sodium, potassium and lithium salts of oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, C<sub>10</sub>-C<sub>22</sub> fatty acids and citric acid. Other examples are organic phosphonate type sequestering agents such as those sold by Monsanto under the trade mark Dequest and alkylhydroxy phosphonates. Citrate salts and C<sub>12</sub>-C<sub>18</sub> fatty acid soaps are preferred.
- Other suitable builders are polymers and copolymers known to have builder properties. For example, such materials include appropriate polyacrylic acid, polymaleic acid, and polyacrylic/polymaleic and copolymers and their salts, such as those sold by BASF under the trade mark Sokalan.

The builders generally constitute from 0 to 3 wt%, more preferably from 0.1 to 1 wt%, by weight of the compositions.

Compositions which comprise an enzyme may optionally contain materials which maintain the stability of the

enzyme. Such enzyme stabilizers include, for example, polyols such as propylene glycol, boric acid and borax. Combinations of these enzyme stabilizers may also be employed. If utilized, the enzyme stabilizers generally  
5 constitute from 0.1 to 1 wt% of the compositions.

The compositions may optionally comprise materials which serve as phase stabilizers and/or co-solvents. Example are C<sub>1</sub>-C<sub>3</sub> alcohols such as methanol, ethanol and  
10 propanol. C<sub>1</sub>-C<sub>3</sub> alkanolamines such as mono-, di- and triethanolamines can also be used, by themselves or in combination with the alcohols. The phase stabilizers and/or co-solvents can, for example, constitute 0 to 1 wt%, preferably 0.1 to 0.5 wt%, of the composition.

15

The compositions may optionally comprise components which adjust or maintain the pH of the compositions at optimum levels. The pH may be from, for example, 1 to 13, such as 8 to 11 depending on the nature of the composition.  
20 For example a dishwashing composition desirably has a pH of 8 to 11, a laundry composition desirable has a pH of 7 to 9, and a water-softening composition desirably has a pH of 7 to 9. Examples of pH adjusting agents are NaOH and citric acid.

25

The containers may themselves be packaged in outer containers if desired, for example non-water soluble containers which are removed before the water-soluble containers are used.

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In use the container are simply added to water where the dissolve. Thus they may be added in the usual way to a

dishwasher or laundry machine, especially in the dishwashing compartment or a drum. They may also be added to a quantity of water, for example in a bucket or trigger-type spray.

## CLAIMS

1. A water-soluble, injection-moulded container comprising a receptacle part and a sealing part which  
5 closes the receptacle part, which container encases a fabric care, surface care or dishwashing composition, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part
- 10 2. A container according to claim 1 wherein the receptacle part has two or more compartments.
3. A container according to claim 2 wherein two or more compartments of the container are provided with  
15 separate sealing parts.
4. A container according to any one of the preceding claims wherein the receptacle part is sealed to the sealing part by a snap-fit mechanism.  
20
5. A container according to any one of the preceding claims wherein the receptacle part is sealed to the sealing part by an adhesive.
- 25 6. A container according to any one of the preceding claims wherein the receptacle part is sealed to the sealing part by a heat-seal.
7. A container according to any one of the preceding  
30 claims which is made from poly(vinyl alcohol).

8. A container according to any one of the preceding claims which encases a dishwashing, water-softening, laundry, detergent or rinse aid composition.
- 5 9. A container according to any one of claims 1 to 7 which encases a disinfectant, antibacterial or antiseptic composition.
- 10 10. A container according to any one of the preceding claims which encases a refill composition for a trigger-type spray.
- 15 11. A container according to any one of the preceding claims wherein the sealing part dissolves before the receptacle part.
- 20 12. A process for preparing a container as defined in any one of the preceding claims which comprises integrally forming a receptacle part and a sealing part joined by a hinge part by injection moulding, filling the container with at least one fabric care, surface care or dishwashing composition, and sealing the receptacle part with the sealing part by operation of the hinge.
- 25 13. A process according to claim 12 which further comprises removing the hinge after the receptacle part has been closed by the sealing part.
- 30 14. An empty water-soluble, injection-moulded container comprising a receptacle part and a sealing part, wherein the receptacle part and the sealing part are integrally moulded and joined by a hinge part.

15. A process for preparing a container as defined in claim 14 which comprises integrally forming a receptacle part and a sealing part joined by a hinge part by  
5 injection moulding.



INVESTOR IN PEOPLE

Application No: GB 0111969.2  
Claims searched: 1-15

Examiner: Darren Handley  
Date of search: 22 October 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B8C (CWA1, CWA2, CWA3, CWS8)

Int Cl (Ed.7): B65D 65/46; C11D 17/04

Other: Online: WPI, EPODOC, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A, P	GB 2358382 A (RECKITT) - see page 61, line 5- page 62, line 7.	
Y	US 5224601 A (GOUGE) - see column 7, line 48- column 8, line 14	1, 2, 6-9, 11, 12, 14, 15
Y	FR 2724388 A (NEGOCE) - see WPI abstract AN-1996-162081 [17].	1, 2, 6-9, 11, 12, 14, 15

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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BUNDESREPUBLIK DEUTSCHLAND



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2. AUGUST 1951

DEUTSCHES PATENTAMT

# PATENTSCHRIFT

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Albert Gourgues, Lyon, Rhone (Frankreich)  
ist als Erfinder genannt worden

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Die Priorität der Anmeldung in Frankreich vom 13. September 1946 ist in Anspruch genommen

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Die Erfindung bezieht sich auf Packungen oder Behältnisse zur Aufnahme von Aufgußmitteln, die sich in pulvrigem, körnigem, pastenartigem oder flüssigem Zustand befinden können und in heißer Flüssigkeit gelöst oder extrahiert werden sollen. Hierfür kommen besonders mehr oder weniger konzentrierte Nahrungs- und Genußmittel in Betracht, wie man sie zum Schnellbereiten von Bouillon, Suppen, Tee oder anderen Heißgetränken, z. B. Kaffee, Milch, Schokolade, Fleischbrühe usw., verwendet.

Die Erfindung schafft eine luftdichte Verpackung, die ihrem Inhalt eine unbegrenzte Haltbarkeit verleiht, da sie ihn gegen den Zutritt von Luft und Feuchtigkeit schützt und hierdurch gegen Verderben, Schimmeln, Klumpenbildung oder Naßwerden sichert. Die Packung nach der Erfindung kennzeichnet sich dadurch, daß zu ihrer Herstellung eine bei niedriger Temperatur, d. h. unterhalb von 100° C, schmelzende Metallegierung verwendet wird, so daß sich die Packung ohne jeglichen Zugriff von Hand durch Schmelzen der Metallegierung selbsttätig öffnet, wenn man sie in die zum Herstellen der Lösung oder des Aufgusses bestimmte Flüssigkeit eintaucht, und zwar erfolgt das Öffnen der Packung erst dann, wenn die Temperatur dieser Flüssigkeit die Schmelztemperatur der Metallegierung erreicht hat.

Die Zeichnung zeigt in schematischen Darstellungen Beispiele für die Ausführung von Packungen nach der Erfindung.

Fig. 1 zeigt den Grundriß, Fig. 2 einen Längsschnitt nach Linie 2-2 von Fig. 1 einer Flachpackung, die aus zwei Blechen 1 und 2 besteht, zwischen denen sich das Aufgußmittel 3 befindet. Die Bleche sind an ihrem Außenrand ringsherum durch Falzung, Schweißung, Lötung, Bördelung, Faltung, Pressung, Stanzung oder auf sonstige Weise fest und luftdicht verbunden. Eines dieser Bleche besteht aus einem Werkstoff, der bei niedriger Temperatur schmilzt, z. B. aus Schmelzlegierungen nach Wood oder Darcet, während das andere Blech aus irgendwelchem sonstigem geeignetem Metall hergestellt ist, z. B. aus Zinnfolie oder dünnem Aluminiumblech.

Die Bleche 1 und 2 können auch alle beide aus bei niedriger Temperatur schmelzendem Metall oder aus Zinn, Aluminium o. dgl. bestehen, wenn man zur Herstellung ihrer Verbindung bei 4 ganz oder teilweise ein Schmelzmetall verwendet.

Gemäß Fig. 3 bis 5 kann eine derartige Packung auch in Gestalt einer kleinen Dose 5 hergestellt werden. Nach Fig. 3 soll der Deckel 6, nach Fig. 4 der Löttrand 7 des Deckels aus bei niedriger Temperatur schmelzendem Metall bestehen, während bei der Dose nach Fig. 5 eine oder mehrere Öffnungen des Deckels durch eine Auflage 8 aus diesem Metall verschlossen sind.

Zu ihrer Verwendung braucht eine derartige Packung, deren luftdichter Verschuß auf unterschiedliche Weise hergestellt sein kann, nur in die Flüssigkeit untergetaucht zu werden, in der sich ihr Inhalt auflösen soll, worauf sie sich dann selbsttätig öffnet, sobald die Temperatur der Lösungsflüssigkeit den Schmelzpunkt der Metallegierung erreicht hat, der z. B. bei 60 bis 100° C liegen kann. Ist dieser Temperaturwert erreicht, so schmilzt die Legierung und gibt damit den Inhalt der Packung an die Lösungsflüssigkeit frei.

#### PATENTANSPRÜCHE:

1. Luftdichte Packung für Aufgußmittel, die zum Lösen oder Ausziehen mit heißer Flüssigkeit bestimmt sind, dadurch gekennzeichnet, daß zur Herstellung der Packung eine bei niedriger Temperatur, d. h. unterhalb 100° C, schmelzende Metallegierung benutzt wird, so daß sich die Packung ohne Zugriff von Hand durch bloßes Eintauchen in die Lösungsflüssigkeit selbsttätig öffnet, wenn die Temperatur der Lösungsflüssigkeit den Schmelzpunkt der Metallegierung erreicht hat.

2. Packung nach Anspruch 1, dadurch gekennzeichnet, daß wenigstens eine ihrer Außenflächen aus einer bei niedriger Temperatur schmelzenden Metallegierung besteht.

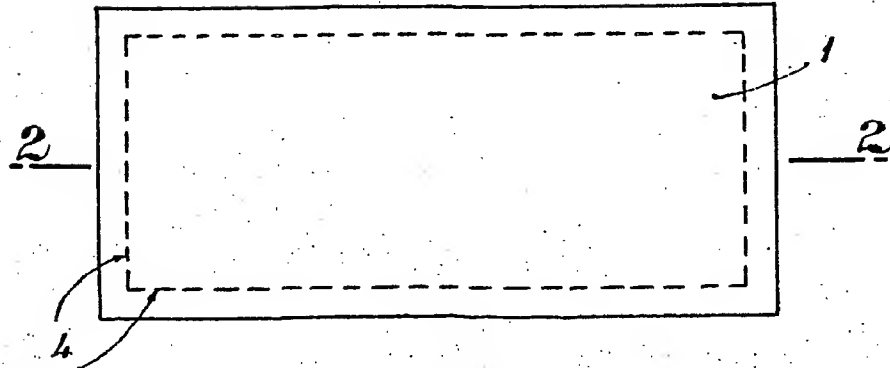
3. Packung nach Anspruch 1, dadurch gekennzeichnet, daß eine ihrer Außenflächen teilweise durch eine bei niedriger Temperatur schmelzende Metallegierung gebildet wird.

4. Packung nach Anspruch 1, dadurch gekennzeichnet, daß die den Packungsbehälter bildenden Teile ganz oder teilweise mittels einer bei niedriger Temperatur schmelzenden Metallegierung zusammengehalten sind.

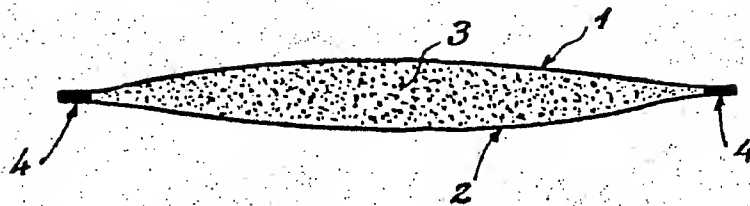
5. Packung nach Anspruch 1 bis 4, dadurch gekennzeichnet, daß die bei niedriger Temperatur schmelzende Metallegierung aus Legierungen nach Wood oder Darcet besteht.

Hierzu 1 Blatt Zeichnungen

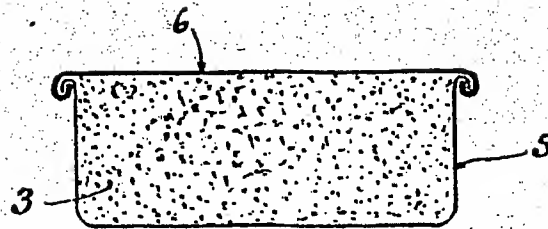
*Fig. 1*



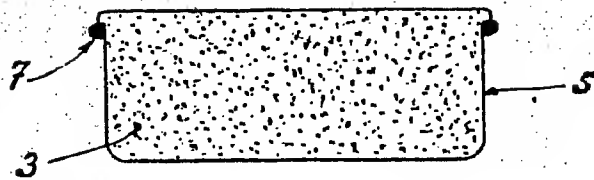
*Fig. 2*



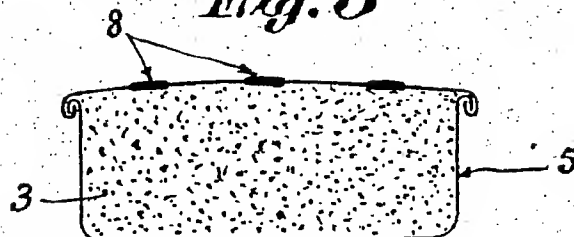
*Fig. 3*



*Fig. 4*



*Fig. 5*



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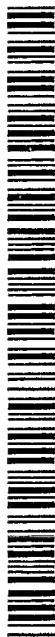
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(54) Title: POUCHED COMPOSITIONS

(57) Abstract: The present invention relates to free-flowing compositions in a pouch having one or more compartments. The compartment and preferably the pouch as a whole are made from stretchable material, typically an elastic film of non-uniform thickness which is water-soluble. The compositions are preferably cleaning compositions or fabric care compositions, in particular laundry or dish washing compositions.



WO 01/83668 A1

## Pouched Compositions

5

### Technical Field

The present invention relates to compositions in a pouch having a compartment enclosing a component, the compartment being formed from a stretched material of non-uniform thickness.

10

### Background to the Invention

Cleaning compositions nowadays come in a number of product forms, such as granules, liquids and tablets, each form having its advantages and disadvantages.

15 Recently, tablets have gained renewed interest, mainly because they are easy to handle for the consumer and easy to dose ('unit dose'). To make tablets storage stable and to prevent breakage of the tablets during handling, the ingredients need to be strongly compressed together and generally binding agents are needed to ensure the tablets do not break. This can reduce their solubility and dispersibility which is undesirable for the  
20 consumers, both from a performance point of view and from a machine or fabric residue point of view.

Thus, alternative ways and better ways to provide easy to handle, unit dose products which do not dust or break, but dissolve complete and fast, are desirable.

25

The inventors have now found an improved method to make a product addressing the above problems, namely by incorporating a product, in particular solid products, in a (partially) water-soluble or -disintegrating or -dispersable pouch in a specific way, such that the above requirements are fulfilled.

30

Pouches for detergents as such are known in the art to be useful to provide unit dose compositions to be delivered to the wash. They typically are described as bag-shape

pouches, loosely containing the product. These pouches can be made of water permeable material or water-soluble material. However, the solubility of these pouched products is not always satisfactory.

5 The inventors have now found improved pouched compositions with improved dissolution, namely pouched compositions having a compartment made from stretchable water-soluble, water-dispersible or water-disintegrating material of non-uniform thickness, this material being stretched around the particulate component (of the composition) in the compartment. The component of the compositions, and preferably the  
10 composition as a whole, is thus typically tightly enclosed in the compartment. Preferred is that at least one component or preferably the composition as a whole is particulate. This way of incorporating the component in a compartment (and of incorporating a composition in a pouch) results in an improved and/ or controlled dissolution in water, e.g. faster and/ or more complete, time-controlled, whilst the pouched composition is  
15 storage stable. It is believed that due to the compartment having a non-uniform thickness and being tightly pressed against the component or composition as a whole, the water penetrates through or dissolves quickly the compartment material, in particularly the thinnest part thereof, whilst during storage the remaining of the material of the compartment is still suitable to protect the product against moisture.

20

Moreover, because the component is tightly enclosed, improved stability upon storage is achieved, because reduced interaction of the ingredients in the component is achieved, similar to compacted tablets. When the component or the composition as a whole is particulate and incorporated by the method of the invention, the component and also the  
25 composition remains free-flowing, unlike tablets, and therefor, the dissolution of the components, and composition, into the wash water is much better.

Furthermore, improved process are provided to form the pouched composition as described above, such that the component of the composition is enclosed by a stretched,  
30 non-uniform compartment material.

#### Summary of the Invention

The present invention provides a liquid or solid composition in a pouch, the pouch comprising one or more compartments and the composition one or more components, the compartment being formed from a stretchable water-disintegrating, water-soluble or water-dispersable material of non-uniform thickness.

5

Preferably, the composition comprising a particulate component, incorporated in a compartment.

10

The non-uniform thickness of the compartment material provides very rapid and/ or controlled release of component into water, whilst still ensuring storage stability of the pouched composition or component thereof.

In particular, the composition in a pouch of the invention is obtainable by a process comprising the steps of:

15

- a) stretching a stretchable material, preferably a film, forming an open compartment, preferably by introducing the material in a mould and stretching the material into the mould to form the open compartment in the shape of the mould;
- 20 b) introducing a component, preferably a particulate component, in the open compartment, such that at least 95% of the volume of the open compartment is filled with the component;
- c) subsequently closing the open compartment.

25

Typically, in step b) the open compartment is filled 100% or even overfilled with the particulate component, and when closing the open compartment, the material thereof remains stretched or is further stretched.

30

The component is typically tightly packed so that the density of the particulate component is increased, i.e. so that the density of the component after closing the compartment is higher than the bulk density of the component prior to incorporation in the compartment, whilst the still free-flowing, which can be noted when the pouch is

removed. This enables more component to be contained in the volume of the pouch, gives the pouch a more pleasing aesthetic appeal to consumers, enables the pouch to be more easily handled by consumers without deforming the shape of the pouch.

5 The composition in the pouch is preferably such that the bulk density of the composition after closing the compartment is 5% to 45% or even to 35%, or it may be preferred that this is 5% to 30% or even 10% to 25% higher than the average of the bulk density of the (particulate) component(s) prior to introduction into the compartment.

10 Preferably, the pouch as a whole is water-soluble. Preferably the composition is a cleaning composition.

The invention also provides processes for making the pouched compositions of the invention, including the process described above.

15

#### Detailed Description of the Invention

##### Pouch and Compartment Thereof

The pouch herein comprises a closed structure enclosing a volume space which comprises the composition. Thus, the pouch can be of any form, shape and material which is  
20 suitable to hold the composition prior to use, e.g. without allowing the release of the composition from the pouch prior to contact of the pouched composition to water. The exact execution will depend on for example the type and amount of the composition in the pouch, the number of compartments in the pouch, the characteristics required from the pouch to hold, protect and deliver or release the compositions.

25

The pouch may be of such a size that it conveniently contains either a unit dose amount of the composition herein, suitable for the required operation. For example, when the composition is a cleaning composition, the amount in the pouch can be such that it is suitable for one wash, or only a partial dose, to allow the consumer greater flexibility to  
30 vary the amount used, for example when the pouched composition is a detergent composition, it may depend on the size and/ or degree of soiling of the wash load.

In one preferred embodiment, the pouched composition has a clearly distinguishable top side and bottom side. Preferably, the pouched composition is formed in a mould with a round or flat bottom and circular walls. Thus, preferred is also that the pouched composition is a spheroid or more preferably cylinder-shaped.

5

The pouch has one or more compartments, whereof preferably at least one contains a particulate component. In one execution, more than one particulate component is present and all particulate components are present in one and the same compartment of the pouch.

10 It may be preferred that one or more compartments for liquid component(s) are present in addition to the compartment(s) comprising the particulate component (s).

However, it may be preferred that there is only one compartment in the pouch, thus containing the composition as a whole. This reduces the material needed to form the  
15 compartment and pouch.

The compartment of the pouch herein also has a closed structure made of a material as described herein, enclosing a volume space, holding the component. Thus, the compartment is made such that it is suitable to hold the component prior to use, e.g.  
20 without allowing the release of the components from the compartment prior to contact of the pouched composition to water. The compartment can have any form or shape, depending on the nature of the material of the compartment, the nature of the component or composition, the intended use, amount of the component etc. If more than one compartment is present, the compartments are linked or connected to one another by any  
25 means, for example sealed by heat sealing or by wetting sealing, glued by any known glue material, as also described hereinafter.

The compartment is made of water-dispersable, water-disintegrating or preferably water-soluble material, preferably a film material which is stretchable. Preferably, the pouch as  
30 a whole is made of a material which is stretchable. This stretchable material is stretched to form the open compartment shape which is filled for more than 95% by volume or even 100% or even over filled. Moreover, the material is preferably elastic, to ensure the

tight packing and to ensure no (additional) head space can be form after closure of the compartment:

Preferred stretchable materials have a maximum stretching degree of at least 150%, preferably at least 200%, more preferably of at least 400% as determined by comparison of the original length of a piece of material with the length of this piece of material just prior to rupture due to stretching, when a force of at least 1 Newton is applied.

Preferably, the material is such that it has a stretching degree as before, when a force of at least 2 Newton, or even at least 3 Newton is used. Preferably, it has this stretching degree when a force of the above lower limits is used, but not more than 20 Newton, or even 12 Newton, or even 8 Newton.

For example, a piece of film with a length of 10 cm and a width of 1 cm and a thickness of 40 microns is stretched lengthwise with a force of for example 2.8 Newton and thus an increasing stress, up to the point that it ruptures. The extent of elongation just before rupture can be determined by continuously measuring the length and the degree of stretching can then be calculated. For example, this piece of film with an original length of 10 cm can be stretched with a force of 2.8 Newton to 52 cm (just before rupture) and thus has a maximum stretching degree of 520% (at a force of at least 2 Newton, namely 2.8 Newton).

The force to stretch such a piece of film (10 cm x 1 cm x 40 microns) to a degree of 200% should preferably be at least 1 Newton, preferably at least 2 Newton, more preferably at least 2.5 or even 3 Newton, and preferably no more than 20 Newton, preferably less than 12 Newton, most preferably less than 8 Newton. This in particular ensures that the elastic force remaining in the film after forming is high enough to immobilize the powders within the pouch, but not too high to easily mould and form a pouch from it.

As is clear from the definition herein, the stretchable material is defined by a degree of stretching measured when it is not present in the closed compartment. However, as said above, the material is stretched when forming the compartment. This can for example

been seen by printing a grid onto the material, e.g. film, prior to stretching, then forming a compartment with the component from this material with grid. It can be seen that squares of the grid are elongated and thus stretched.

- 5 The elasticity of the stretchable material of the compartment and preferably the pouch as a whole is herein typically defined as the 'elasticity recovery'. This can be determined by stretching the material (for example to an elongation of 200%, as set out above) and measuring the length of the material after release of the stretching force. For example a piece of film of a length of 10 cm and width 1 cm and thickness of 40 microns is  
10 stretched lengthwise to 20 cm (200% elongation) with a force of 2.8Newtons (as above), and then the force is removed. The film snaps back to a length of 12 cm, which means 80% elastic recovery.

- The elasticity of the pouch material referred to herein, is the elasticity at the time of  
15 making the pouch. Prolonged stretching, for example that typically occurs during storage of the pouch, will decrease the elasticity of the pouch material due to plastic creeping. It is preferred that at the time of making the pouch or compartment thereof, the compartment material has an elasticity such that the elastic recovery is from 20% to 100%, more preferably from 50% or from 60% or more preferably from 75% or even  
20 80% to 100%.

Thus, the material of the compartment (and preferably the pouch as a whole) is stretched during formation and/ or closing of the compartment or pouch, such that the resulting pouched composition has a compartment or pouch which is at least partially stretched.

- 25 The stretching of the material of the compartment when forming the compartment may be done by any means for example by applying a force on the material, including the use of an vacuum, optionally while heating the material.

- Typically and preferably, the degree of stretching is non-uniform over the compartment  
30 or pouch, due to the formation and closing process. For example, when a film is positioned in a mould and an open compartment is formed by vacuum forming (and then filled with the components and then closed) the part of the film in the bottom of the

mould, furthest removed from the points of closing, will be stretched more than in the top part. The material of the compartment has typically a thickness variation from 10% to 1000%, preferably 20% to 600%, or even 40% to 500% or even 60% to 400%. This can be measured by any method, for example by use of an appropriate micrometer. This can  
5 be measured with a pair of calipers such as available from Mitutoyo UK Ltd, under no. CD-6''CP.

Therefor, it may be preferred that the component to be delivered *first* to the water is comprised in a bottom layer of the compartment, and a component which is to be  
10 delivered to the water at a later stage is comprised in a subsequent layer, closer to the top of the compartment. Alternatively, or in addition, it may be preferred that the least moisture sensitive component is comprised in the bottom layer of the compartment and a more moisture sensitive component is comprised in a subsequent or top layer.

#### 15 Material of Pouch and Compartment

Preferably, the composition is a composition to be delivered to water and thus, the pouch and the compartment (s) thereof are designed such that at least one or more of the components is released at, or very shortly after, the time of addition to the water. Thus it is preferred that the compartment and preferably the pouch is formed from a material  
20 which is water-dispersible or more preferably water-soluble.

In one preferred embodiment, the component is delivered to the water within 3 minute, preferably even within 2 minutes or even within 1 minute after contacting the pouched composition to water.

25 Preferred water-dispersable material herein has a dispersability of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out hereinafter using a glass-filter with a maximum pore size of 50 microns.

More preferably the material is water-soluble and has a solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out  
30 hereinafter using a glass-filter with a maximum pore size of 20 microns, namely:

Gravimetric method for determining water-solubility or water-dispersability of the material of the compartment and/or pouch:

10 grams  $\pm$  0.1 gram of material is added in a 400 ml beaker, whereof the weight has been determined, and 245ml  $\pm$  1 ml of distilled water is added. This is stirred vigorously on magnetic stirrer set at 600 rpm, for 30 minutes. Then, the mixture is filtered through a folded qualitative sintered-glass filter with the pore sizes as defined above (max. 20 or 50 micron). The water is dried off from the collected filtrate by any conventional method, and the weight of the remaining polymer is determined (which is the dissolved or dispersed fraction). Then, the % solubility or dispersability can be calculated.

Preferred materials are polymeric materials, preferably polymers which are formed into a film or sheet. The material in the form of a film can for example be obtained by casting, blow-molding, extrusion or blow extrusion of the polymer material, as known in the art.

Preferred polymer copolymers or derivatives thereof are selected from polyvinyl alcohols, polyvinyl pyrrolidone, polyalkylene oxides, (modified) cellulose, (modified)cellulose-ethers or -esters or -amides, polycarboxylic acids and salts including polyacrylates, copolymers of maleic/acrylic acids, polyaminoacids or peptides, polyamides including polyacrylamide, polysaccharides including starch and gelatine, natural gums such as xanthum and carragum. Preferably, the polymer is selected from polyacrylates and acrylate copolymers, including polymethacrylates, methylcellulose, sodium carboxymethylcellulose, dextrin, maltodextrin, ethylcellulose, hydroxyethyl cellulose, hydroxypropyl methylcellulose,; most preferably polyvinyl alcohols, polyvinyl alcohol copolymers and/ or hydroxypropyl methyl cellulose(HPMC).

The polymer may have any weight average molecular weight, preferably from about 1000 to 1,000,000, or even form 10,000 to 300,000 or even form 15,000 to 200,000 or even form 20,000 to 150,000.

Mixtures of polymers can also be used. This may in particular be beneficial to control the mechanical and/or dissolution properties of the compartment or pouch, depending on the application thereof and the required needs. For example, it may be preferred that a

mixture of polymers is present in the material of the compartment, whereby one polymer material has a higher water-solubility than another polymer material, and/ or one polymer material has a higher mechanical strength than another polymer material. It may be preferred that a mixture of polymers is used, having different weight average molecular weights, for example a mixture of PVA (or a copolymer thereof) and/ or HPMC of a weight average molecular weight of 10,000- 40,000, preferably around 20,000, and of PVA (or copolymer thereof) and/ or HPMC with a weight average molecular weight of about 100,000 to 300,000, preferably around 150,000.

Also useful are polymer blend compositions, for example comprising hydrolytically degradable and water-soluble polymer blend such as polylactide and polyvinyl alcohol, achieved by the mixing of polylactide and polyvinyl alcohol, typically comprising 1-35% by weight polylactide and approximately 65-99 by weight polyvinyl alcohol, if the material is to be water-dispersable, or water-soluble.

It may be preferred that the polymer present in the material of the compartment is from 60-98% hydrolysed, preferably 80% to 90%, to improve the dissolution of the material.

Most preferred are materials which are water-soluble stretchable and elastic material comprising PVA polymer having properties such as the PVA films sold under the trade reference M8630, as sold by Chris-Craft Industrial Products of Gary, Indiana, US.

Preferably, the level of a type polymer (e.g. commercial mixture) in the film material, for example PVA polymer, is at least 60% by weight of the material or film, preferably at least 60% or even at least 70% or even at least 80 or 90%. The upper level is up to 100%, but typically 99% or even 98% by weight.

The material herein may comprise other additive ingredients then the polymer or polymer material. For example, it may be beneficial to add plasticisers, for example glycerol, ethylene glycol, diethyleneglycol, propylene glycol, sorbitol and mixtures thereof, additional water, disintegrating aids. It may be useful when the pouched composition is a detergent composition, that the pouch or compartment material itself comprises a

detergent additive to be delivered to the wash water, for example organic polymeric soil release agents, dispersants, dye transfer inhibitors.

5 The material in the form of a film may be coated, preferably only one-sided, with any coating method and with any coating agent, depending on the required properties; for example, it may be beneficial to coat the film such that the compartment or pouch or composition therein, is more storage stable and/or less sensitive to moisture and/ or acts as a improved moisture barrier.

10 A very useful form is to coat the material or film on one side with a coating that slows the dissolution of the film, prior to forming of the compartment and thus prior to stretching the material or film. Then, by stretching the material or film, the coating is stretched as well, resulting in cracks in the coating and/ or uneven distribution of the coating over the material and thus over the compartment. This then ensures still stability against moisture  
15 during storage, whilst the presence of cracks or the uneven distribution still ensures the required dissolution in use. Hence it is possible to make a pouched composition that is resistant to being handled with wet fingers when it is picked up at the sides but will still release product rapidly when it is immersed in water due to film rupture at the thinnest points.

20 Any coating material can be used, particular useful are hydrophobic coatings, or polymers with a low water-solubility, lower then defined herein before.

25 The compartment material may be shrinkable material, so that the surface area can be reduced during or subsequent to closing the open compartment by shrinking the material.

Preferably, the open compartment is closed with a piece of the same material as the material of the open compartment. The closing material, and thus preferably also the open compartment material or shape material, is preferably thermoplastic so that it can be  
30 closed by heat-sealing. Alternatively, a thermoplastic coating may be provided, either over the whole material or just in the areas where seals are to be formed. The sealing can also be made by solvent welding or wetting sealing. Suitable heat-sealable materials

include polyvinyl alcohol, polyvinyl acetate, polyvinyl pyrrolidone, polyethylene oxide, acrylic resins and mixtures thereof, in particular polyvinyl alcohols.

#### Compositions and Components Thereof

5 The composition of the invention is present in a pouch and is herein also referred to as pouched composition. The composition comprises preferably at least one particulate component, in particular because the open compartment can then be overfilled with particulate component and then closed, to increase the stretching of the film and the tight packing and even density increase. Generally, the particulate component is a powder,  
10 granular, extrudate or flake component. Preferably the composition is in the form of free-flowing powder. Preferably, the composition or component thereof is not in the form of a tablet. Preferred are cleaning compositions, such as laundry detergents, dish washing detergent, and fabric care compositions such as conditioners and other rinse additives.

15 The pouched composition herein is obtainable by a method whereby the component is introduced in the open compartment (preferred processes herefor being described below) such that the open compartment is almost completely filled, typically such that at least 95% of the volume of that open compartment (shape), preferably at least 98% or (in particular when the component is particulate) even at least 100% of the open  
20 compartment shape is filled, prior to closing said open compartment shape. More preferably, the open compartment (shape) is overfilled with the particulate components, i.e. that the volume of the components is more than 100% of the volume of the shape, preferably more than 105% or more preferably more than 110% or even more than 115%.

25 The composition in the pouch herein can for example be obtainable by a process involving:

- a) stretching a stretchable material, preferably a film, thereby forming an open compartment, preferably by introducing the material in a mould and  
30 stretching the material into the mould to form the compartment in the shape of the mould;

- b) introducing a (particulate) component in the open component, such that at least 95% but preferably at least 100% of the volume of the open compartment is filled with the particulate component;
- c) subsequently closing the open compartment.

5

In one preferred process, step a), or b) and c) of the process above may be performed under reduced pressure, lower than atmospheric pressure, preferably by applying a vacuum, so that after filling and closing under reduced pressure or vacuum, a tightly packed compartment is obtained.

10

The compartment can be closed by further stretching the material and closing the compartment, but preferably the open compartment is closed with an additional piece of material, which may be the same type of material. Preferably, the open compartment and the closing material are both films of stretchable material, preferably both water-soluble materials. They can then be sealed together by any means, to ensure closure of the compartment, for example by wet welding or more preferably heat sealing.

15

Typically, the incorporation of the particulate component into the compartment is such that the bulk density of component after closing the compartment is increased with 5% to 45% preferably to 35%, preferably 5% or even 10% to 30% or even to 25%, or even 8% to 20% or even to 15%, compared to the bulk density of the component prior to incorporation in the compartment.

20

The bulk density of a component prior to incorporation in the pouched composition can be determined by the Repour Cup method, as described in ISO 3424- 1975-E.

25

The bulk density of the component after closing of the compartment can be determined by a method of volume displacement. For example, a vessel with a wide neck and an off-take arm is filled with a solvent of known density, which must not affect the compartment material, up to the level of the collecting arm. The component in the compartment to be tested is accurately weighed and then immersed in the liquid, for example by using a piece of thin metal wire. The amount of liquid that is displaced is the liquid leaving the

30

vessel through the arm and this is collected and carefully weighed. The replaced volume of displaced liquid is easily calculated from this weight and the known density of the liquid. Then, the volume replacement due to the material of the compartment (rather than the component therein) can be measured or calculated. The volume replacement is  
5 measured within 5 minutes of immersing the pouch in the liquid. This is deducted from the volume replacement as measured in the above test, to obtain the volume replacement of the actual component. The density of the component as it is in the closed compartment can then be calculated. (Errors associated with the thin wire used to immerse the pouch are minor and are not taken into account.) Depending on the material of compartment, a  
10 suitable liquid can be selected. For example, for water-soluble material such as PVA, preferred liquid is glycerol or Neodol 23-5. This is because the compartment may contain microscopic pinholes in the film as a result of the stretching. Using a viscous solvent such as glycerol will minimize any errors due to liquid seeping into the pouch. Also useful are nonionic surfactants such as Neodol 23-5.

15 The tight packing can be done by increasing the packing efficiency and reducing space between the particles of the component, for example by vibration of the components in the open compartment, allowing the component particles to settle for a period of time, modestly increasing pressure provided that the component and typically the composition  
20 as a whole remains free-flowing, for example by applying a pressure of up to 20Mpa, preferably up to 10Mpa or more preferably up to 5Mpa or even up to 2MPa, if any pressure is used.

If the component is in particulate form, then the bulk density of the component can be  
25 achieved by a compaction step. Typically, the particulate component is first placed in the open compartment, and then a pressure is exerted on said component causing the bulk density of said component to increase from 5% to 50%, preferably from 10% or from 15% or from 20%, and preferably to 45%, or to 40%, or to 35%, or to 30% of the original bulk density of the component prior to the compaction step.

30 The pressure may be exerted in the form of a solid body, which is typically of a size and shape that is capable of fitting into the opening of the open compartment. The solid body is capable of applying pressure to said component. Preferably, the solid body applies a

pressure of up to 20Mpa, preferably up to 10Mpa or more preferably up to 5Mpa or even up to 2MPa, to the particulate component.

5 In a preferred embodiment of the present invention, an indent is formed in the particulate component, preferred by contact of a solid body to the particulate component, even more preferably the indent is formed during the compaction step. This indent is particular beneficial if the pouch formed is in the form of a multi-compartment pouch, and comprises a first compartment and a second compartment. The particulate component having the indent formed therein, is typically contained in the first compartment. The  
10 indent of the first compartment allows the second compartment to be more easily joined to the first compartment, and reduces the complexity and difficulty of the process for forming the multi-compartment pouch and increases the stability and structural strength of the multi-compartment pouch.

15 It may be preferred that the composition in the pouch comprises different components, for example more than one particulate component or liquid component, or mixtures thereof. Then, it may be preferred that the different components are comprised in different compartments, and it may be preferred that the thickness of the material of one compartment is different to another compartment, so that controlled or sequential release  
20 of the component therein can be achieved.

When used herein, 'different' component means that one component has at least one different chemical property, for example at least one different ingredient, than the other component or components, or one component has at least one different physical property  
25 than another component or component. Examples are described herein after.

The composition and the component herein can be any composition, in particular any free-flowable granular or powder composition to be delivered to water, and active in water.

30

Preferred compositions are beverages, edible compositions, pharmaceutical compositions, personal care compositions, cleaning compositions, fabric care or conditioning

compositions; most preferably, the compositions herein are cleaning compositions or fabric care compositions, preferably hard surface cleaners, more preferably laundry or dish washing compositions, including detergents, pretreatment or soaking compositions or fabric conditioners, and other rinse additives.

5

When used in cleaning compositions the component can contain any active cleaning ingredient. In particular preferred are active ingredients such as surfactants, chelating agents, builders, enzymes, perfumes, bleaches, bleach activators, fabric softeners, fabric conditioners, antibacterial agents, effervescence sources, brighteners, photo-bleaches.

10

Fabric care compositions or rinse additives preferably comprise at least one or more softening agents, such as quaternary ammonium compounds and/ or softening clays, and preferably additional agent such as anti-wrinkling aids, perfumes, chelants, fabric integrity polymers.

15

Generally, water is present in the component at a level of up to 10%; in particular when the component is particulate, the level of water is preferably from 0.2% to 5% or even 0.2% to 3% or even from 0.5% to 2% by weight of the component.

20 Although the nature of the pouched composition is such that it readily dissolves or disperses into the water, it may be preferred that disintegrating agents such as effervescence sources, water-swellaable polymers or clays are present in the pouch or compartment material it self, and/ or in the composition therein, in particular effervescence sources based on an acid and a carbonate source. Suitable acids include the  
25 organic carboxylic acids such as fumaric acid, maleic acid, malic acid, citric acid; suitable carbonate sources include sodium salts of carbonate, bicarbonate, percarbonate. Preferred levels for the disintegrating aids or effervescence sources or both are from 0.05% to 15% or even from 0.2% to 10% or even from 0.3 to 5% by weight pouched composition.

30

The particulate component comprises preferably at least one particulate compound, but typically the component comprises at least two particulate compounds, preferably

thoroughly mixed to form the component. Because the component in the compartment of the pouch is tightly packed, the interaction between the different ingredients is reduced. This allows the incorporation in a component of even incompatible ingredients, if required. Thus, the component may comprise one or more enzymes and a bleach such as a peroxygen bleach, such as a salt of percarbonate. It may however be beneficial to include the bleaching agents, but in particular the peroxygen bleach, in a different component than the enzymes and/ or other hygroscopic materials or anhydrous or hydratable materials including overdried materials such as aluminosilicates, anhydrous salts or acids.

When the pouched compositions is such that it has a clear top and bottom side and different component are present in the form of layers, it can also be beneficial to include in the bottom layer non-gelling detergent ingredients, such as water-soluble salts and acids, including for example effervescing salts and acids such as carbonate salts and organic carboxylic acids such as citric acid, and in a higher layer or the top layer potential gelling ingredients such as anionic and nonionic surfactants. At the bottom part, the compartment material is typically more stretched, which will lead to the bottom region to be dissolved prior to the top region of the pouched composition.

It may even be possible that part or all of the ingredients in particulate component are not pre-granulated, such as agglomerated, spray-dried, extruded, prior to incorporation into the compartment, and that the component is a mixture of dry-mixed powder ingredients or even raw materials. Preferred may be that for example less than 60% or even less than 40% or even less than 20% of the components are free-flowable pre-granulated granules

Also, it has been found that it is beneficial for the cleaning performance, when the cleaning compositions herein or the material of the compartment or pouch, preferably both the composition and said material, comprise one or more chelating agents, in particular phosphonate- and/or carboxylate-containing chelating agents, in particular EDDS or EDTA or HEDP.

It has also been found that the presence in the wash water of high levels of certain dissolved compartment or pouch material having free hydroxy groups can have a negative effect on the removal of clay stains, under certain wash conditions. Therefore, it is not only beneficial to use as little compartment material as possible and thus to use preferably  
5 a pouch with only one compartment, but it has also been found that it is beneficial to incorporate in the composition or the pouch material a polyalkoxylated compound, preferably a polyalkoxylated alcohol, preferably having an average alcohol carbon chain length of 11 to 24, preferably 12 to 20 or even 14 to 18, and an average alkoxylation degree of at least 20 or even at least 40 or even at least 70. Highly preferred are from  
10 0.1% to 8%, or even from 0.5 to 5% or even from 0.8% to 3% by weight of the pouched composition of such a compound; highly preferred is TAE80.

Another preferred ingredient is a perhydrate bleach, such as salts of percarbonates, particularly the sodium salts. It has been found that in when the pouch or compartment  
15 comprises a material with free hydroxy groups, such as PVA, the preferred bleaching agent comprises a percarbonate salt and is preferably free from any perborate salts, and also borate salts. The borates and perborates interact with these hydroxy-containing materials this can reduce the dissolution of the materials and may also result in reduced performance.

20 Preferred are also organic peroxyacid bleach precursor or activator compound, such as alkyl percarboxylic precursor compounds of the imide type include the N-,N,N<sup>1</sup>N<sup>1</sup> tetra acetylated alkylene diamines wherein the alkylene group contains from 1 to 6 carbon atoms, particularly those compounds in which the alkylene group contains 1, 2 and 6  
25 carbon atoms such as tetraacetyl ethylene diamine (TAED), sodium 3,5,5-tri-methyl hexanoyloxybenzene sulfonate (iso-NOBS), sodium nonanoyloxybenzene sulfonate (NOBS), sodium acetoxymethyl benzene sulfonate (ABS) and pentaacetyl glucose, but also amide substituted alkyl peroxyacid precursor compounds.

30 Highly preferred ingredient for use herein are one or more enzymes. Preferred enzymes include the commercially available lipases, cutinases, amylases, neutral and alkaline proteases, cellulases, endolases, esterases, pectinases, lactases and peroxidases

conventionally incorporated into detergent compositions. Suitable enzymes are discussed in US Patents 3,519,570 and 3,533,139. Preferred commercially available protease enzymes include those sold under the tradenames Alcalase, Savinase, Primase, Durazym, and Esperase by Novo Industries A/S (Denmark), those sold under the tradename  
5 Maxatase, Maxacal and Maxapem by Gist-Brocades, those sold by Genencor International, and those sold under the tradename Opticlean and Optimase by Solvay Enzymes. Preferred amylases include, for example,  $\alpha$ -amylases obtained from a special strain of *B licheniformis*, described in more detail in GB-1,269,839 (Novo). Preferred commercially available amylases include for example, those sold under the tradename  
10 Rapidase by Gist-Brocades, and those sold under the tradename Termamyl, Duramyl and BAN by Novo Industries A/S. Highly preferred amylase enzymes may be those described in PCT/ US 9703635, and in WO95/26397 and WO96/23873. The lipase may be fungal or bacterial in origin being obtained, for example, from a lipase producing strain of *Humicola* sp., *Thermomyces* sp. or *Pseudomonas* sp. including *Pseudomonas*  
15 *pseudoalcaligenes* or *Pseudomonas fluorescens*. Lipase from chemically or genetically modified mutants of these strains are also useful herein. A preferred lipase is derived from *Pseudomonas pseudoalcaligenes*, which is described in Granted European Patent, EP-B-0218272.

Another preferred lipase herein is obtained by cloning the gene from *Humicola*  
20 *lanuginosa* and expressing the gene in *Aspergillus oryza*, as host, as described in European Patent Application, EP-A-0258 068, which is commercially available from Novo Industri A/S, Bagsvaerd, Denmark, under the trade name Lipolase. This lipase is also described in U.S. Patent 4,810,414, Høge-Jensen et al, issued March 7, 1989.

25 Preferred are also anionic surfactants, which include salts (including, for example, sodium, potassium, ammonium, and substituted ammonium salts such as mono-, di- and triethanolamine salts) of the anionic sulfate, sulfonate, carboxylate and sarcosinate surfactant, preferably linear or branched alkyl benzene sulfonate, alkyl sulphates and alkyl ethoxysulfates, isethionates, N-acyl taurates, fatty acid amides of methyl tauride,  
30 alkyl succinates and sulfosuccinates, monoesters of sulfosuccinate (especially saturated and unsaturated C<sub>12</sub>-C<sub>18</sub> monoesters) diesters of sulfosuccinate (especially saturated and

unsaturated  $C_6-C_{14}$  diesters), N-acyl sarcosinates. Highly preferred is that when anionic surfactants are present, at least one alkyl sulphate surfactant is present, preferably a branched alkyl sulphate surfactant, preferably at a level of 1% to 20% or even to 15% by weight of the component or composition.

5

Also preferred are nonionic surfactants such as nonionic surfactant selected from the classes of the nonionic condensates of alkyl phenols, nonionic ethoxylated alcohols, nonionic ethoxylated/propoxylated fatty alcohols, nonionic ethoxylate/propoxylate condensates with propylene glycol, and the nonionic ethoxylate condensation products with propylene oxide/ethylene diamine adducts.

10

Cationic surfactants and softening agents may also be included herein, for example quaternary ammonium surfactants and softening agents, and choline ester surfactants.

15

Colouring agent such as iron oxides and hydroxydes, azo-dyes, natural dyes, may also be present in the composition or preferably in the compartment or pouch material, preferably present at levels of 0.001% and 10% or even 0.01 to 5% or even 0.05 to 1% by weight of the pouched composition.

20

## Examples

### Example 1

25

A piece of Chris-Craft M-8630 film, 38 microns thick, is placed on top of a mould and fixed in place. The mould consists of a cylindrical shape with a diameter of 45 mm and a depth of 25 mm. A 1 mm thick layer of rubber remains present around the edges of the mould. The mould has some holes in the mold material to allow a vacuum to be applied.

30

A vacuum is applied to pull the film into the mold and pull the film flush with the inner surface of the mould. 40 g of a detergent powder mix comprising percarbonate salt and water-soluble salts and organic acids, typically carbonate salts, citric acid and/ or citrate, enzymes, bleach activator and surfactants is poured into the mould. This powder mix has

a bulk density of 860 g/l prior to being poured into the mould. This is slightly vibrated. The mould is filled between 105% to 115%.

5 Next, a sheet of the same M-8630 film is placed over the top of the mould with the powder and sealed to the first layer of film by applying an annular piece of flat metal of an inner diameter of 46 mm and heating that metal under moderate pressure onto the ring of rubber at the edge of the mould, to heat-seal the two pieces of film together. The metal ring is typically heated to a temperature of 140 - 146 °C and applied for up to 5 seconds. The film is stretched during this process, which can be visualised by using in this  
10 example a film material with a grid on it. The thickness variation of the film is between 20 and 40 microns, the bottom being 20 microns, the top being 40 microns and the sides varying between 20 and 40 microns.

15 The bulk density of the pouched composition was then tested by the method described above and found to be 1020 g/l.

Pouches made by the above method released product on immersion in 5 liters of 10 °C water in less than 10 seconds.

20 A 10 cm x 1 cm x 40 microns piece of this film material itself was tested for elasticity and stretchability, using a 2.8 Newton force, as described above. The maximum stretching degree was 520 and the elastic recovery was 85%.

### Example 2

25 The example 1 is repeated, filling the open pouch in the mould first with 17.5 g of detergent component comprising 8 gram sodium percarbonate and 4 gram citric acid and 5.5 gram sodium carbonate and then 17.5 gram of a component comprising 0.1 gram enzymes, 5 gram anionic surfactant and 10 gram zeolite, 2.4 gram of perfume, bleach activator (TAED), brighteners, and other minor additives.

30

### Example 3

The example 1 is repeated, filling the open pouch in the mould first with 30 g of detergent component comprising sodium percarbonate and citric acid and sodium carbonate enzymes anionic surfactant and zeolite, perfume, bleach activator (TAED), brighteners, and other minor additives as in example 2, the balance being sodium sulphate filler salts, and then a second layer of 5 gram of a fabric softening clay was added.

The following are detergent compositions which may also be suitable incorporated in a pouch of the invention:

	A	B	C	D	E	F	G	H	I
<u>Spray-dried Granules</u>									
LAS	10.0	10.0	15.0	5.0	5.0	10.0	-	-	-
TAS	-	1.0	-				-	-	-
branched or linear synthetic alkyl sulphate surfactant	-	-	2.0	5.0	5.0		-	-	-
cationic surfactant			1.0	1.0			-	-	-
DTPA, HEDP and/or EDDS	0.3	0.3	0.5	0.3			-	-	-
MgSO <sub>4</sub>	0.5	0.5	0.1	-			-	-	-
Sodium citrate	-	-	-	3.0	5.0		-	-	-
Sodium carbonate	10.0	7.0	15.0			10.0	-	-	-
Sodium sulphate	5.0	5.0	-	-	5.0	3.0	-	-	-
Sodium silicate 1.6R	-	-	-	-	2.0		-	-	-
Zeolite A	16.0	18.0	20.0	20.0	-	-	-	-	-
SKS-6	-	-	-	3.0	5.0	-	-	-	-
polyacrylic and/ or polymaleic acid polymer, or salt	1.0	2.0	11.0	-	-	2.0	-	-	-
PEG 4000	-	2.0	-	1.0	-	1.0	-	-	-
Brightener	0.05	0.05	0.05	-	0.05	-	-	-	-
Silicone oil	0.01	0.01	0.01	-	-	0.01	-	-	-

effervescence granule of 50% citric acid and 50% sodium carbonate	10	7.0	-	-	-	-	-	-	-
<u>Agglomerate</u>									
LAS			-	-	-	-	2.0	2.0	-
branched or linear synthetic alkyl sulphate surfactant			-	-	-	-	-	4.0	4.0
ethoxylated alkyl sulphate surfactant			-	-	-	-	-	1.0	0.5
Carbonate			-	-	4.0	1.0	1.0	1.0	-
Sodium citrate			-	-	-	-	-	-	5.0
Citric acid			-	-	-	4.0	-	1.0	1.0
SRP			-	-	-	1.0	1.0	0.2	-
Zeolite A			-	-	-	15.0	26.0	15.0	16.0
PEG	-	-	-	-	-	-	4.0	-	-
<u>Builder Agglomerates</u>									
SKS-6	6.0	-	-	-	6.0	3.0	-	7.0	10.0
LAS	4.0	5.0	-	-	5.0	3.0	-	10.0	12.0
<u>Dry-add particulate components</u>									
effervescence granule (as above)	-	4.0	10.0	4.0	25	8.0	12.0	2.0	4.0
TAED	2.5	-	-	1.5	2.5	6.5	-	1.5	-
MBAS	-	-	-	8.0	-	-	8.0	-	4.0
LAS (flake)	10.0	10.0	-	-	-	-	-	8.0	-
sodium percarbonate	15.0	-	-	10.0	15.0	5.0	-	11.0	-
speckle	-	-	-	0.3	0.05	0.1	-	-	-



Claims

1. A liquid or solid composition in a pouch, the pouch comprising one or more compartments and the composition one or more components, the compartment  
5 being formed from a stretchable water-disintegrating, water-soluble or water-dispersible material of non-uniform thickness.
2. A composition as in claim 1 which is solid, preferably particulate.
- 10 3. A composition in a pouch according to claim 1 or 2 obtainable by a process comprising the steps of:
  - a) stretching a stretchable material, preferably a film, forming an open compartment, preferably by introducing the material in a mould and  
15 stretching the material into the mould to form the open compartment in the shape of the mould;
  - b) introducing the component in the open compartment, such that at least 95% of the volume of the open compartment is filled with the component;
  - c) subsequently closing the open compartment.
- 20 4. A composition according to claim 3 whereby the component is particulate and the process comprises the step of increasing the bulk density of the component with 5% to 45%, preferably 5% to 35% or even 20%, or even 10% to 25%.
- 25 5. A composition according to claim 3 or 4 whereby step a) or b) and c) are performed under reduced pressure which is lower than atmospheric pressure, preferably by applying a vacuum.
- 30 6. A composition according to claim 3 or 4 whereby in step b) the component is particulate and introduced in the open compartment such that at least 100%, preferably at least 110%, of the volume of the open compartment is occupied by the component.

7. A composition in a pouch according to any preceding claim whereby the compartment is formed from an elastic material, preferably a film.
- 5 8. A composition according to any of claims 3 to 6 whereby the compartment is formed from a stretchable, shrinkable material and in step c) the surface area of the compartment is reduced during or subsequent to closing the open compartment by shrinking the open compartment and/or compartment, preferably by heat-shrinking.
- 10 9. A composition according to any preceding claim whereby the compartment is formed from a material of non-uniform thickness having a variation in thickness of at least 40%, preferably up to 500%.
- 15 10. A composition in a pouch according to any preceding claim whereby the stretchable material has a maximum stretching degree of at least 200% and preferably an elastic recovery of from 50% to 100%.
- 20 11. A composition in a pouch according to any preceding claim whereby the compartment and the pouch are water-soluble.
12. A composition in a pouch according to any preceding claim whereby the compartment is formed from a film comprising polyvinyl alcohol polymer.
- 25 13. A composition in a pouch according to any preceding claim which is a cleaning composition in a pouch, preferably a laundry or dish washing detergent in a pouch.
- 30 14. A process as in claim 3 for making the pouched product as in any of claims 1 to 13.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/07776

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C11D17/04 B65D65/46 C11D3/37

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C11D B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	GB 2 355 269 A (PROCTER & GAMBLE) 18 April 2001 (2001-04-18) page 4, paragraph 2 -page 8, paragraph 1; claims 1,2,10 ---	1,3,7, 9-14
A	DATABASE WPI Week 199602 Derwent Publications Ltd., London, GB; AN 1996-016178 XP002172454 & JP 07 290567 A (DAINIPPON INK & CHEM IND), 7 November 1995 (1995-11-07) abstract ---	1,11-13
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/07776

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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⑤④ **Produkt für die Freisetzung von Behandlungsmitteln in die Waschflüssigkeit einer automatischen Wasch- oder Geschirrspülmaschine.**

⑤⑦ Um einen portionierten Reiniger für Geschirrspülmaschinen bereitzustellen, der einfach und sicher handhabbar ist, wird ein Produkt zur Freisetzung von Behandlungsmitteln in die Waschflüssigkeit einer automatischen Wasch- oder Geschirrspülmaschine vorgeschlagen, das einen Beutel mit wenigstens einer ein Behandlungsmittel enthaltenden Kammer umfaßt, wobei die Kammerwände aus wasserlöslichem Folienmaterial mit einer solchen Wasserlöslichkeit bestehen, daß das Behandlungsmittel innerhalb des Zeitraums bis zum Beginn des Klarspülens entsprechend der Art des Behandlungsmittels freigesetzt wird.

Die vorliegende Erfindung betrifft ein Produkt für die Freisetzung von Behandlungsmitteln in die Waschflüssigkeit einer automatischen Wasch- oder Geschirrspülmaschine in Form eines Beutels, der wenigstens eine ein Behandlungsmittel enthaltende Kammer umfaßt.

Konventionelle Reinigungsmittel für Geschirrspülmaschinen sind im Stand der Technik vielfach bekannt.

- 5 Sie bestehen im wesentlichen aus den Komponenten Alkalitriphosphat, Alkalimetasilikat und Alkalicarbonat. Daneben sind organische Additive wie nicht schäumende Tenside, Polycarboxylate (Homopolymere der Acrylsäure oder Copolymere mit Maleinsäure), Chlorabspalter (z.B. Natriumdichlorisocyanurat) im Einsatz.

Neuere Entwicklungen zielen auf den Ersatz von Phosphat, um die Eutrophierung der Oberflächengewässer zu reduzieren.

- 10 Neben dieser ökologischen Seite ist auch die Toxikologie der verwendeten Reinigungsmittel von Bedeutung. Gesetzliche Maßnahmen führen dazu, daß hochalkalische Produkte ab 1991 in der BRD nur in kindergesicherten Verpackungen auf den Markt gebracht werden dürfen. Dies führte zur Entwicklung von Geschirreinigern mit verminderter Alkalität, um die Gefährdung des Verbrauchers, vor allem von Kindern, zu verringern, ohne andererseits das Müllproblem durch die aufwendigere Verpackung zu vergrößern. Gleichzeitig verzichten die neuen Reiniger auf Chlorverbindungen.

- 15 Derartige Reiniger werden nicht nur zur Reinigung des Geschirrs, sondern ebenso in größeren Mengen zur Grundreinigung und Entfettung der Spülmaschine selbst eingesetzt. Aufgrund der Tatsache jedoch, daß der zur Reinigung und Entfettung der Maschine eingesetzte Maschinenreiniger in größeren Mengen in die Geschirrspülmaschine gegeben wird, die nicht in die Dosierkammer gegeben werden können, muß der Maschinenreiniger in Pulverform in den Innenraum der Geschirrspülmaschine gegeben werden. Bei falscher Anwendung, wenn das Pulver gehäuft auf das in der Maschine befindliche Sieb geschüttet wurde, waren Verklumpungen des Pulvers in der Umwälzpumpe die Folge, und hohe Reparaturkosten wurden verursacht. Damit verbunden waren ebenfalls durch die pulverförmige Konsistenz Verstaubungen des Materials, die beim Einatmen zu einer Reizung der Atemwege führen.

- 20 Diese Nachteile können dadurch beseitigt werden, daß die lose geschütteten Pulver in Form von portionierten Wasch- oder Geschirreinigungsmitteln angeboten werden. Die portionierten Reiniger bieten gegenüber dem lose geschütteten Pulver einige Vorteile wie z.B. gleichbleibende Dosierung, keine oder weniger Staubbildung, kein oder geringerer Hautkontakt, kein oder geringeres Verklumpen sowie kein Verschütten von Pulver. Dabei werden zwei verschiedene Lösungswege beschritten.

- 30 Die pulverförmigen Bestandteile werden mit oder ohne spezielle Tablettierhilfsmittel zu Tabletten (Tabs) verpreßt. Es entstehen teilweise sehr harte Preßlinge, die deshalb auch als kindersicher bezeichnet werden, weil sie weniger leicht aufgenommen werden können als Pulver. Es bleibt jedoch insbesondere bei erhöhter Alkalität die Gefahr des Verätzens der Zunge bestehen. Derartige Reinigungsmittel in Tablettenform für Spül- oder Waschmaschinen sind beispielsweise in der DE-A-2926253, DE-A-4010524 und DE-A-4010533 beschrieben.

- 35 Eine weitere Möglichkeit zur Bereitstellung von portionierten Reinigern ist durch die Verwendung von Portionsbeuteln gegeben. Ein derartiger Portionsbeutel ist beispielsweise in der DE-A-4011508 beschrieben, die ein Textilwaschmittel für eine Waschmaschine offenbart, wobei der Portionsbeutel aus unlöslichem wasserdurchlässigem Gewebe besteht. Dabei ist die Korngrößenverteilung des granulatformigen Inhalts so gewählt, daß die Maschenweite des Gewebes kleiner als die Korngröße ist. Das Produkt kann somit erst nach dem Auflösen durch eindringendes Wasser freigesetzt werden. In der FR-A-2616796 werden Portionsbeutel mit flüssigen Waschmitteln beschrieben.

- 40 Während die portionierten Waschmittel für die Waschmaschine meist direkt in die Trommel auf die Wäsche gegeben werden und dann ein Programm ohne Vorwäsche durchgeführt wird, liegen bei der Spülmaschine andere Voraussetzungen vor. Beutel aus unlöslichem Gewebe, wie sie für Waschpulver eingesetzt werden, sind für die Spülmaschine ungeeignet, da die Gefahr besteht, daß sich der Beutel in der Maschine, im Sieb oder auf dem Geschirr festsetzen und so einen einwandfreien Ablauf des Prozesses verhindern würde.

- 45 Wenn auch die oben genannten Reinigertabletten für die Spülmaschine die bereits erwähnten Vorteile von portionierten Reinigern aufweisen, so zeigen sie doch erhebliche Nachteile, die bei den gebräuchlichen Ausführungen noch unterschiedlich sind. Bei den Reinigertabletten ist zwischen den Tabs solcher Größe zu unterscheiden, die in die Dosierkammer der Maschine gegeben werden können, und solchen Reinigertabletten, die aufgrund ihrer Größe nur in den Besteckkorb oder in eigens dafür vorgesehene Halter eingebracht werden.

- 50 Beide Ausführungsformen der Reinigertabletten haben jedoch den Nachteil, daß die Tabletten eine verzögerte Löslichkeit besitzen, so daß sie erst langsam voll wirksam werden, wohingegen pulverförmige Reiniger eine hohe Lösegeschwindigkeit aufweisen. Bei Tabletten, die aufgrund der Größe in die Dosierkammer der Maschine gegeben werden können, fällt die Tablette normalerweise bei Öffnung der Dosier-

kammer ungehindert auf den Innenboden der Spülmaschine und löst sich dort nur langsam auf, da das Wasser dort nur wenig mechanische Energie aufbringt.

Tabletten, die aufgrund ihrer Größe nicht mehr in die Dosierkammer gegeben werden können, werden direkt in den Besteckkorb oder einen separaten Halter eingelegt. Dadurch wird ein Teil des Reinigers bereits im Vorspülgang aufgelöst. Das bedeutet, daß die Tablette so hart sein muß, daß nur wenig Substanz im Vorspülgang aufgelöst wird und die Hauptmenge im Hauptspülgang zur Verfügung steht. Dadurch erhöht sich jedoch die Gefahr einer Laugenverschleppung bis zur Klarspülung, da die genaue Einhaltung der Lösegeschwindigkeit der Tablette schwierig ist.

Die Aufgabe der vorliegenden Erfindung bestand nun darin, einen portionierten Reiniger für die Geschirrspülmaschine bereitzustellen, der einfach und sicher handhabbar ist und die oben erwähnten Nachteile nicht mit sich bringt.

Die Aufgabe der Erfindung wird gelöst durch Bereitstellung eines Produktes zur Freisetzung von Behandlungsmitteln in die Waschflüssigkeit einer automatischen Wasch- oder Geschirrspülmaschine, umfassend einen Beutel mit wenigstens einer ein Behandlungsmittel enthaltenden Kammer, wobei die Kammerwände aus wasserlöslichem Folienmaterial mit einer solchen Wasserlöslichkeit bestehen, daß das Behandlungsmittel innerhalb des Zeitraums bis zum Beginn des Klarspülvorgangs entsprechend der Art des Behandlungsmittels freigesetzt wird. Dabei kann der erfindungsgemäße Beutel entsprechend seiner Größe, der je nach Verwendungszweck von 10 bis 500 g Behandlungsmittel enthalten kann, in die Dosierkammer oder in den Geschirrkorb gegeben werden.

Bei entsprechender Größe mit einem Inhalt bis ca. 25 g kann der Beutel wie ein Pulver oder Granulat von der Dosierkammer der Spülmaschine aufgenommen werden. Bei größeren Beuteln wird dieser in den Geschirrkorb gegeben. Durch Wahl des geeigneten Beutelmaterials kann die Wasserlöslichkeit beliebig gewählt werden, so daß das Behandlungsmittel zu Beginn des Waschprozesses im Vorspülgang oder während des Heißspülgangs freigesetzt wird. Als Beutelmateriale können hierbei wasserlösliche Folien auf Basis synthetischer oder natürlicher Polymere, wie Stärke, Polyvinylalkohol oder modifiziertem Polyvinylalkohol, die auch biologisch abbaubar sein können, verwendet werden. Bevorzugt ist hierbei die Verwendung von Polyvinylalkohol oder acetyliertem Polyvinylalkohol.

Überraschenderweise bringt hier die Verwendung von Polyvinylalkohol keine starke Schaumbildung mit sich, die üblicherweise in Spülmaschinen bei Umwälzung der Lauge auftritt und die eine ständige Zuführung der Reinigerlösung auf das Geschirr stark hemmt oder sogar unterbindet, da die Umwälzpumpe nur Luft oder Schaum ansaugt.

Bei dem erfindungsgemäßen Beutel mit Kammerwänden aus Polyvinylalkohol und einem Reiniger als Behandlungsmittel treten nach Auflösung des Beutels in der Spülmaschine keinerlei Schaumprobleme auf und der Druck der Laugenpumpe sinkt nicht ab, so daß die Mechanik der Spülmaschine nicht behindert wird. Dabei wird sogar die Schmutztragefähigkeit der Reinigerlösung in der Spülmaschine durch den Polyvinylalkohol unterstützt. Dieser synergistische Effekt wirkt sich vor allem bei der Entfernung von dispergierbarem Schmutz positiv aus.

Die Verwendung von Polyvinylalkohol als Folienmaterial ist auch aus dem Grund bevorzugt, da der Polyvinylalkohol der Folie in der Kläranlage vollständig biologisch abgebaut wird und vollkommen ungiftig ist. Dadurch wird bei gleichzeitiger Verwendung der oben erwähnten Reinigerzusammensetzung die umweltschonende Formulierung des portionierten Reinigers ökologisch stark aufgewertet. Gleichzeitig wird gegenüber einer Einzelverpackung von z.B. Tabletten der Abfall wesentlich reduziert und die Gefahren im Haushalt beim Umgang mit dem Reiniger ebenfalls minimiert.

Als bevorzugte Behandlungsmittel zur Reinigung von Geschirr wird dabei eine Zusammensetzung verwendet, die besteht aus

10 - 70 Gew.% wasserlöslichem Alkalisilikat mit einem Verhältnis von Siliciumdioxid zu Alkalioxid von größer als 1:1,

0 - 50 Gew.% Alkalicarbonat,

2 - 20 Gew.% polymere Sequester bzw. Dispergatoren, vorzugsweise vom Typ der Polycarboxylate, insbesondere Homopolymere der Acrylsäure oder Copolymere mit anderen organischen Säuren oder Äthern, die Vinylgruppen enthalten,

0 - 40 Gew.% Alkalisalze von organischen Säuren mit sequestrierender Wirkung auf Calciumionen wie Polycarbonsäuren, insbesondere Zitronensäure oder aus Zucker fermentativ gewonnene Säuren, insbesondere Glukonsäure,,

2 - 15 Gew.% eines borfreien Bleichmittels auf Sauerstoffbasis aus der Gruppe der Peroxverbindungen

gen oder Peroxohydrate oder Mischungen daraus, die im Wasser Wasserstoffperoxid freisetzen,

0 - 15 Gew.% eines Bleichaktivators aus der Gruppe von Verbindungen, die unter Einwirkung von Wasserstoffperoxid reaktive Persäuren, insbesondere Peressigsäure freisetzen,

0 - 5 Gew.% eines Alkalisalzes einer Phosphonsäure zur Stabilisierung des Bleichmittels bei der Lagerung,

0 - 5 Gew.% Enzyme oder Enzymgemische aus der Gruppe der Hydrolasen, insbesondere Proteasen, Amylasen und Lipasen,

0,5 - 5 Gew.% eines schwachschäumenden, nicht-ionischen oder anionischen Tensides, wobei die Summe der einzelnen Komponenten 100 Gew.% beträgt.

Besonders bevorzugt ist die Verwendung einer Zusammensetzung, die besteht aus

## II

25 - 60 Gew.%, insbesondere 40-50 Gew.%, amorphes Natriumdisilikat mit  $\text{SiO}_2:\text{Na}_2\text{O}$  von 1,9:1 bis 2,1:1,

10 - 40 Gew.%, insbesondere 25-35 Gew.%, Natriumcarbonat,

3 - 10 Gew.%, insbesondere 4-8 Gew.%, Polyacrylatmaleinat (7:3) als Natriumsalz,

3 - 10 Gew.%, insbesondere 4-7 Gew.%, Natriumglukonat,

5 - 25 Gew.%, insbesondere 5-15 Gew.%, Natriumpercarbonat,

0 - 15 Gew.%, insbesondere 3-7 Gew.%, TAED (Tetraacetylenhydylendiamin),

0 - 2 Gew.%, insbesondere 0,2-0,5 Gew.%, HEDP (Hydroxyethan-1,1-diphosphonsäure) als Natriumsalz,

0 - 5 Gew.% Mischung aus stabilisierten Enzymen, insbesondere Proteasen, Amylasen und Lipasen,

0 - 5 Gew.% schwachschäumende, ionische oder anionische Tenside,

wobei die Summe der einzelnen Komponenten 100 Gew.% beträgt.

Dabei dienen die Silikate und Carbonate als milde Alkalien zur Verbesserung der Schmutzentfernung durch Aufquellen, und die Silikate zusätzlich als Korrosionsschutz. Durch gezielte Wahl der Carbonate z.B. aus der Gruppe Natriumcarbonat, Natriumsesquicarbonat und Natriumhydrogencarbonat bzw. Mischungen daraus läßt sich der pH-Wert des Reinigers zwischen ca. 9,5 und 11,5 einstellen und puffern.

Sowohl die genannten Polycarboxylate bzw. andere Polymere als auch die organischen Säuren bzw. deren Salze dienen vor allem zur Bindung der Wasserhärte, die trotz Ionenaustauscher immer noch in der Spülmaschine vorhanden sein kann. Auch das polymere Material des Beutels selbst trägt wie die anderen Polymeren zusätzlich zur Dispergierung von Feststoffen, wie z.B. Spinat-Partikeln, bei.

Das Bleichsystem besteht aus dem Aktivsauerstoff-Spender aus der Gruppe der Perverbindungen, dem Aktivator, wie z.B. TAED und dem Stabilisator, vorzugsweise aus der Gruppe der Phosphate. Allerdings kommen auch Stickstoffbasen als Komplexbildner für Eisen und Schwermetalle in Frage, die wie im Falle von Glycinabkömmlingen sogar biologisch abbaubar sind. Diese Stabilisatoren-Verbindungen verzögern den durch die Metallionen katalysierten Zerfall der Aktivsauerstoffverbindungen durch Komplexbildung der Metallionen. Im Falle von Polyvinylalkohol als Folienmaterial muß der Sauerstoffträger unbedingt borfrei sein, da die Borate mit dem Polyvinylalkohol zu schwerlöslichen Komplexen reagieren, was die Löslichkeit des Beutels negativ beeinflußt.

Die schaumarmen Tenside tragen durch ihre entschäumende Wirkung und die Solubilisierung von Fetten zur Reinigungsleistung bei. Die Enzyme wirken sehr spezifisch auf Speisereste. So werden durch die Amylase Stärkereste und durch die Protease Eiweißreste gezielt angegriffen. Da sie bereits in äußerst geringen Mengen starke Wirkung zeigen und biologisch abbaubar sind, tragen sie zur geringen Umweltbelastung des portionierten Reinigers bei. Gleiches gilt auch für die Lipase, die zur besseren Entfettung eingesetzt werden kann.

Um auch borhaltige Perverbindungen, wie z.B. Perborat, einsetzen zu können, wäre auch der Einsatz von Stärke oder modifizierter Stärke als Beutelmateriale möglich.

Wenn der erfindungsgemäße Beutel ein größeres Fassungsvermögen von ca. 250 g aufweist, kann das erfindungsgemäße Produkt geeigneterweise zur Reinigung und Entfettung der Maschine selbst verwendet werden. Dabei können als Reinigungsmittel die zuvor genannten Zusammensetzungen verwendet werden.

Selbstverständlich kann der erfindungsgemäße Beutel auch zur Reinigung von Waschmaschinen verwendet werden. Hier befreien die entkalkenden Behandlungsmittel vor allem die Heizelemente der Waschmaschine, wohingegen die alkalischen Reiniger die sogenannten Fettläuse entfernen. Letztere sind Ablagerungen aus Bestandteilen der Waschmittel, Fett und Härtebildnern des Wassers, die oftmals durch Unterdosierung der Waschmittel entstehen.

Bei einer weiteren Ausführungsform des erfindungsgemäßen Produktes umfaßt das Produkt eine zweite, ein zweites Behandlungsmittel enthaltende Kammer, die der ersten Kammer über einen gemeinsamen Saum benachbart, von dieser getrennt oder in dieser enthalten sein kann. Der innere Beutel kann auch vollständig vom äußeren Beutel getrennt oder daran befestigt sein. Eine integrierte Konstruktion, erzeugt durch Falten, ist ebenso möglich. Entsprechend einer weiteren Möglichkeit kann die zweite Kammer in einer getrennten, zusätzlichen dritten Kammer, getrennt von der ersten Kammer vorliegen.

Zweckmäßigerweise sind die Wasserlöslichkeiten der Kammerwände der beiden Kammern derart unterschiedlich, daß die Auflösung der jeweiligen Kammerwand und die Freisetzung des darin enthaltenen Behandlungsmittels zu unterschiedlichen Zeitpunkten im Verlauf des Reinigungsprozesses vor Beginn des Klarspülvorgangs erfolgt.

Die Wasserlöslichkeit der Kammerwände kann dadurch beispielsweise beeinflußt werden, daß die Kammerwände der beiden Kammern aus wasserlöslichem Folienmaterial mit unterschiedlichen Dicken und/oder aus unterschiedlichen Polymeren oder Mischungen davon bestehen. Dadurch kann beispielsweise erreicht werden, daß der Inhaltsstoff der ersten Kammer im Verlauf des mit kaltem Wasser durchgeführten Vorspülgangs und der Inhaltsstoff der zweiten Kammer erst im Verlauf des mit heißem Wasser durchgeführten eigentlichen Reinigungsschrittes freigesetzt werden. Das verwendete Folienmaterial kann dabei eine Dicke von 1 µm bis 2 mm besitzen.

Als Inhaltsstoff der ersten Kammer kann dann beispielsweise ein Entkalker eingesetzt werden, der ausgewählt wird aus der Gruppe, die besteht aus Zitronensäure, Harnstoffphosphat- und Sulfaminsäure oder anderen festen anorganischen oder organischen Säuren bzw. sauren Salzen.

Zusätzlich wird bei der Formulierung mit der oben angegebenen Zusammensetzung in Folge der Alkalireduktion bei folgender Vorgehensweise jeglicher direkte Kontakt mit dem Reiniger vermieden. Dabei wird kein Staub freigesetzt und die Atemwege werden nicht gereizt.

Durch geeignete Wahl verschiedener wasserlöslicher Folien auf Basis modifizierten Polyvinyl-Alkohols kann demzufolge ein erfindungsgemäßes Produkt mit zwei Kammern bereitgestellt werden, wobei der Entkalker in der Kammer aus kaltwasserlöslicher Folie und der alkalische Grundreiniger in der Kammer aus heißwasserlöslicher Folie abgepackt ist. Bei einem Programmablauf der Spülmaschine wirkt dann im Vorspülgang der Entkalker, wogegen der alkalische Reiniger erst beim Aufheizen im Hauptspülgang seine Wirkung entfaltet. Bei dieser Arbeitsweise ist zur Reinigung und Entfettung der Geschirrspülmaschine nur ein Arbeitsgang notwendig. Ein entsprechendes Ergebnis läßt sich ebenso bei Verwendung von zwei getrennten Beuteln erzielen, die jeweils Kammern aus unterschiedlichen Folienmaterialien mit unterschiedlichen Inhaltsstoffen umfassen.

Als Kleber für das die Kammer bildende Folienmaterial können die üblicherweise auf diesem Gebiet verwendbaren wasserlöslichen Kleber verwendet werden. Als Beispiel eines geeigneten wasserempfindlichen Klebers ist Natriumcarboxymethylcellulose genannt.

Als eine weitere Ausführungsform wird ein erfindungsgemäßes Produkt bereitgestellt, das dadurch gekennzeichnet ist, daß der wenigstens eine Kammer umfassende Beutel mit einem oder mehreren, wenigstens eine Kammer umfassenden Beuteln über Folienbereiche verbunden ist, die zwischen benachbarten Beuteln Abrißbereiche aufweisen, die gegebenenfalls perforiert sein können und die eine Trennung der einzelnen Beutel voneinander erlauben. So ist dem Verbraucher eine einfache Portionierung der Menge des Behandlungsmittels möglich.

Die vorliegende Erfindung wird anhand der nachfolgenden Beispiele näher erläutert.

#### 1) Maschinenreiniger

Die Rezeptur aus Beispiel II wird mit 250 g in Portionsbeutel aus kaltwasserlöslichem Polyvinylalkohol mit einer Wandstärke von 40 µm abgepackt. Die Alkalität des Reinigers ist so eingestellt, daß das Folienmaterial nicht beeinträchtigt wird. Eine Maschine mit starken Ablagerungen von Essensresten im Sieb der Umwälzpumpe wird wie folgt behandelt:

Zu Beginn des Hauptspülgangs ohne Spülgut wird die Maschine geöffnet und der originalverschlossene Beutel in den oberen Geschirrkorb gelegt. Nach dem Schließen wird das Wasser sofort wieder umgewälzt und der Beutelinhalt praktisch beim ersten Kontakt mit dem Wasser freigesetzt und gleichmäßig verteilt. Nach Beenden des Programms ist das Sieb wieder frei von Essensresten. Ein Parallelversuch mit dem gleichen Pulver, das unsachgemäß angehäuft direkt auf das Sieb geschüttet wird, führt dazu, daß der Reiniger sich in dem Ansaugschlauch der Umwälzpumpe verhärtet und eine Reparatur nötig wird.

2) Entkalker

Das gleiche Beutelmateriel wie in Beispiel 1) wird mit 250 g Citronensäure befüllt. Bei gleicher Vorgehensweise wie unter 1) werden Kalkablagerungen in der Maschine, vor allem auf den Heizstäben entfernt.

3) Kombinierte Packung

Beim Anschluß der Spülmaschine an Kaltwasser kann eine Kombipackung zum Einsatz gelangen, die aus verschiedenen Folien aufgebaut ist. Als Entkalker dient der Beutel aus 2). Der Reiniger wie unter 1) befindet sich in einem Beutel aus einem Polyvinylacetat, das nur teilweise zu Polyvinylalkohol umgesetzt ist. Dadurch kann die Wasserlöslichkeit beeinflußt werden. Der Grad der Umsetzung wird so gewählt, daß die Folie sich erst ab einer Temperatur von 45° bis 50°C vollständig auflöst. Die Wandstärke beträgt ca. 100 µm, damit der Beutel nicht vorzeitig aufplatzt und das Produkt freisetzt.

Eine Spülmaschine mit Essensresten im Sieb und Kalkablagerungen auf den Heizstäben wird wie folgt behandelt:

In den oberen Geschirrkorb werden die beiden getrennten Beutel (ein Entkalker und ein Reiniger) ungeöffnet nebeneinander gelegt. Danach wird ein 65°C-Programm mit Vorspülgang gewählt. Bei eingesetzten Siemens Spülmaschine Typ Lady Plus 260 ist dies das Normalprogramm. Im Vorspülgang mit Kaltwasser (Zulauf ca. 17°C) löst sich der Beutel mit der Citronensäure auf und der Kalk auf den Heizstäben wird entfernt. Der Beutel mit dem alkalischen Reiniger wird dabei nur wenig angelöst. Die saure Lösung wird abgepumpt und frisches Wasser für den Hauptspülgang läuft ein. Nach Beginn des Umwälzens und Aufheizens öffnet sich der zweite Beutel mit dem Reiniger bei Erreichen von ca. 40° bis 50°C. Nun kann der alkalische Reiniger die Essensreste im Sieb angreifen. Ergebnis: In einem Arbeitsgang ist die Maschine entkalkt und von Essensresten gereinigt. Dies spart gegenüber getrennte Anwendung Wasser und Energie.

4) Geschirr-Reiniger

Beim Einsatz von Stärke als Beutelmateriel läßt sich vorteilhaft die Rezeptur I einsetzen, da das stabilere Perborat als Sauerstoffbleiche enthalten ist. Da ein Teil der Protease allerdings durch das Beutelmateriel aufgebraucht wird, ist die Entfernung der Haferflocken etwas schlechter. Wird bei Mischung I Polyvinylalkohol als Beutelmateriel verwendet, findet man schleimige Rückstände in der Maschine und auf dem Geschirr.

Die Leistung der Reiniger ist aus der nachfolgenden Tabelle zu entnehmen:

Rezeptur-Beispiele in Gewichtsprozent	I	II	III
Natriumcarbonat	30	25	-
Natriumsesquicarbonat		-	25
Natriumdisilikat	40,7	33,7	33,7
Copolymer Acrylsäure/ Maleinsäurehydrid	5	5	5

	Natriumgluconat	5	5	5
	Natriumpercarbonat	—	15	15
5	Natriumperborat Monohydrat	9	—	—
	TAED	4	6	6
	HEDP-Na-Salz	0,3	0,3	0,3
10	nichtschäumendes Tensid	2	2	2
	Enzymzubereitung Protease	2	2	2
	Enzymzubereitung Amylase	2	2	2
15	<u>Werte:</u>			
	pH-Wert			
	Gesamtalkali-gehalt			
	Reinigungsindex R(i)			
20	nach DIN 44990 gesamt:		4,25	4,30
	Haferflocken	3,75	4,42	3,98
	Hackfleisch	4,38	4,46	4,48
	Spinat	3,40	3,45	3,50
25	Tee	4,78	4,88	4,52

Zu den Versuchen ist anzumerken, daß die Reinigungsleistung der Formulierung I mit Beutel aus Stärke ermittelt wurde, die anderen mit Beuteln aus kaltwasserlöslichem Polyvinylalkohol. Die Dosierung betrug 25 g. Bei gleicher Dosierung wurde mit dem Referenz-Reiniger nach der Vorschrift DIN 44990 ein Reinigungsindex von 3,98 erreicht.

#### Patentansprüche

1. Produkt zur Freisetzung von Behandlungsmitteln in die Waschflüssigkeit einer automatischen Wasch- oder Geschirrspülmaschine umfassend einen Beutel mit wenigstens einer ein Behandlungsmittel enthaltenden Kammer, wobei die Kammerwände aus wasserlöslichem Folienmaterial mit einer solchen Wasserlöslichkeit bestehen, daß das Behandlungsmittel innerhalb des Zeitraums bis zum Beginn des Klarspülens entsprechend der Art des Behandlungsmittels freigesetzt wird.
2. Produkt nach Anspruch 1 dadurch gekennzeichnet, daß der Beutel eine zweite, ein zweites Behandlungsmittel enthaltende Kammer umfaßt, wobei die Kammerwände aus wasserlöslichem Folienmaterial mit einer solchen Wasserlöslichkeit bestehen, daß das Behandlungsmittel innerhalb des Zeitraums bis zum Beginn des Klarspülvorgangs entsprechend der Art des Behandlungsmittels freigesetzt wird.
3. Produkt nach Anspruch 2 dadurch gekennzeichnet, daß die zweite Beutelkammer sich innerhalb der ersten Beutelkammer befindet.
4. Produkt nach Anspruch 2 oder 3 dadurch gekennzeichnet, daß die Wasserlöslichkeit des Folienmaterials der Kammerwände der beiden Kammern derart unterschiedlich ist, daß die Auflösung der jeweiligen Kammer und Freisetzung des darin enthaltenen Behandlungsmittels zu unterschiedlichen Zeitpunkten im Verlauf des Reinigungsprozesses erfolgt.
5. Produkt nach Anspruch 4 dadurch gekennzeichnet, daß die Kammerwände der beiden Kammern aus wasserlöslichem Folienmaterial mit unterschiedlichen Dicken und/oder aus unterschiedlichen Polymeren oder Mischungen davon bestehen.

6. Produkt nach einem der Ansprüche 1 bis 5 dadurch gekennzeichnet, daß das wasserlösliche Folienmaterial ausgewählt wird, aus der Gruppe, die besteht aus Stärke, Polyvinylalkohol, acetyliertem Polyvinylalkohol.
- 5 7. Produkt nach einem der Ansprüche 1 bis 6 dadurch gekennzeichnet, daß als Behandlungsmittel ein granuläres phosphatfreies Behandlungsmittel für das maschinelle Geschirrspülen mit einer Zusammensetzung eingesetzt wird, die besteht aus
- 10 10 - 70 Gew.% wasserlöslichem Alkalisilikat mit einem Verhältnis von Siliciumdioxid zu Alkalioxid von größer als 1:1,
- 0-50 Gew.% Alkalicarbonat,
- 2-20 Gew.% polymere Sequester bzw. Dispergatoren, vorzugsweise vom Typ der Polycarboxylate insbesondere Homopolymere der Acrylsäure oder Copolymere mit anderen organischen Säuren oder Äthern, die Vinylgruppen enthalten,
- 15 0 - 40 Gew.% Alkalisalze von organischen Säuren mit sequestrierender Wirkung auf Calciumionen wie Polycarbonsäuren, insbesondere Zitronensäure oder aus Zucker fermentativ gewonnene Säuren, insbesondere Glukonsäure,
- 2-15 Gew.% eines borfreien Bleichmittels auf Sauerstoffbasis aus der Gruppe der Peroxoverbindungen oder Peroxohydrate oder Mischungen daraus, die in Wasser Wasserstoffperoxid freisetzen,
- 20 0-15 Gew.% eines Bleichaktivators aus der Gruppe von Verbindungen, die unter Einwirkung von Wasserstoffperoxid reaktive Persäuren, insbesondere Peressigsäure freisetzen,
- 0-5 Gew.% eines Alkalisalzes einer Phosphonsäure zur Stabilisierung des Bleichmittels bei der Lagerung,
- 0-5 Gew.% Enzyme oder Enzymgemische aus der Gruppe der Hydrolasen, insbesondere Proteasen, Amylasen und Lipasen
- 25 0,5 - 5 Gew.% eines schwachschäumenden, nicht-ionischen oder anionischen Tensides, wobei die Summe der einzelnen Komponenten 100 Gew.% beträgt.
8. Produkt nach Anspruch 7 dadurch gekennzeichnet, daß als Behandlungsmittel ein granuläres phosphatfreies Behandlungsmittel für das maschinelle Geschirrspülen mit einer Zusammensetzung eingesetzt wird, die besteht aus
- 30 25-60 Gew.%, insbesondere 40-50 Gew.%, amorphes Natriumdisilikat mit  $\text{SiO}_2:\text{Na}_2\text{O}$  von 1,9:1 bis 2,1:1,
- 10-40 Gew.%, insbesondere 25-35 Gew.%, Natriumcarbonat
- 3-10 Gew.%, insbesondere 4-8 Gew.%, Polyacrylatmaleinat (7:3) als Natriumsalz
- 35 3-10 Gew.%, insbesondere 4-7 Gew.%, Natriumglukonat,
- 5-25 Gew.%, insbesondere 5-15 Gew.%, Natriumpercarbonat,
- 0-15 Gew.%, insbesondere 3-7 Gew.%, TAED (Tetraacetylenhydramin),
- 0-2 Gew.%, insbesondere 0,2-0,5 Gew.%, HEDP (Hydroxyethan-1,1-diphosphonsäure) als Natriumsalz
- 40 0-5 Gew.% Mischung aus stabilisierten Enzymen, insbesondere Proteasen, Amylasen und Lipasen
- 0-5 Gew.%, schwachschäumende, ionische oder anionische Tenside, wobei die Summe der einzelnen Komponenten 100 Gew.% beträgt.
9. Produkt nach einem der Ansprüche 1 bis 6 dadurch gekennzeichnet, dass als Behandlungsmittel pulverförmiger, saurer Entkalker eingesetzt wird, der ausgewählt wird aus der Gruppe, die besteht aus Zitronensäure, Sulfaminsäure, Harnstoffphosphat oder anderen festen anorganischen oder organischen Säuren oder sauren Salzen.
- 45 10. Produkt nach Anspruch 1 u.9, dadurch gekennzeichnet, dass die Kammerwände aus kaltwasserlöslichem Polyvinylalkohol bestehen.
- 50 11. Produkt nach einem der Ansprüche 2 bis 5, dadurch gekennzeichnet, dass der Beutel 2 Kammern umfasst, wobei die erste Kammer als Behandlungsmittel einen pulverförmigen sauren Entkalker, ausgewählt aus der Gruppe, die besteht aus Zitronensäure, Sulfaminsäure, Harnstoffphosphat oder anderen festen organischen oder anorganischen Säuren oder sauren Salzen, enthält und die zweite Kammer als Behandlungsmittel ein granuläres, phosphatfreies Behandlungsmittel für das Geschirrspülen mit einer Zusammensetzung enthält, die besteht aus
- 55 10 - 70 Gew.% wasserlöslichem Alkalisilikat mit einem Verhältnis von Siliciumdioxid zu Alkalioxid

von grösser als 1:1,

0-50 Gew.% Alkalicarbonat,

2-20 Gew.% polymere Sequester bzw. Dispergatoren, vorzugsweise vom Typ der Polycarboxylate insbesondere Homopolymere der Acrylsäure oder Copolymere mit anderen organischen Säuren oder Äthern, die Vinylgruppen enthalten,

0 - 40 Gew.% Alkalisalze von organischen Säuren mit sequestrierender Wirkung auf Calciumionen wie Polycarbonsäuren, insbesondere Zitronensäure oder aus Zucker fermentativ gewonnene Säuren, insbesondere Glukonsäure,

2-15 Gew.% eines borfreien Bleichmittels auf Sauerstoffbasis aus der Gruppe der Peroxoverbindungen oder Peroxohydrate oder Mischungen daraus, die in Wasser Wasserstoffperoxid freisetzen,

0-15 Gew.% eines Bleichaktivators aus der Gruppe von Verbindungen, die unter Einwirkung von Wasserstoffperoxid reaktive Persäuren, insbesondere Peressigsäure freisetzen,

0-15 Gew.% eines Alkalisalzes einer Phosphonsäure zur Stabilisierung des Bleichmittels bei der Lagerung,

0-15 Gew.% Enzyme oder Enzymgemische aus der Gruppe der Hydrolasen, insbesondere Proteasen, Amylasen und Lipasen,

0-5 Gew.% eines schwachschäumenden, nicht-ionischen oder anionischen Tensides, wobei die Summe der einzelnen Komponenten 100 Gew.% beträgt.

12. Produkt nach Anspruch 11, dadurch gekennzeichnet, dass als granuläres, phosphatfreies Behandlungsmittel eine Zusammensetzung eingesetzt wird, die besteht aus

25-60 Gew.%, insbesondere 40-50 Gew.%, amorphes Natriumdisilikat mit  $\text{SiO}_2:\text{Na}_2\text{O}$  von 1,9:1 bis 2,1:1,

10-40 Gew.%, insbesondere 25-35 Gew.%, Natriumcarbonat,

3-10 Gew.%, insbesondere 4-8 Gew.%, Polyacrylat-Maleinat (7:3) als Natriumsalz,

3-10 Gew.%, insbesondere 4-7 Gew.%, Natriumglukonat,

5-25 Gew.%, insbesondere 5-15 Gew.%, Natriumpercarbonat,

0-15 Gew.%, insbesondere 3-7 Gew.%, TAED (Tetraacetylenhydramin),

0-2 Gew.%, insbesondere 0,2-0,5 Gew.%, HEDP (Hydroxyethan-1,1-diphosphonsäure) als Natriumsalz,

0-5 Gew.% Mischung aus stabilisierten Enzymen, insbesondere Proteasen, Amylasen und Lipasen,

0-5 Gew.%, schwachschäumende, ionische oder anionische Tenside,

wobei die Summe der einzelnen Komponenten 100 Gew.% beträgt.

13. Produkt nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, dass der wenigstens eine Kammer umfassende Beutel mit einem oder mehreren, wenigstens eine Kammer umfassenden Beuteln über Folienbereiche verbunden ist, die zwischen benachbarten Beuteln Abrissbereiche aufweisen, die gegebenenfalls perforiert sein können und die eine Trennung der einzelnen Beutel voneinander erlauben.

14. Produkt nach Anspruch 1, 2 und 8, dadurch gekennzeichnet, dass die Kammerwände aus kaltwasserlöslichem Polyvinylalkohol mit einer Wandstärke von ca. 40  $\mu\text{m}$  bestehen und das Behandlungsmittel ein Reinigungsmittel nach Anspruch 8 ist,

15. Produkt nach einem der Ansprüche 1, 2, 11 und 12, dadurch gekennzeichnet, dass die Wände der ersten Kammer aus kaltwasserlöslichem Polyvinylalkohol und die Wände der zweiten Kammer aus Polyvinylacetat mit einer Wandstärke von ca. 100  $\mu\text{m}$  bestehen.

16. Produkt nach Anspruch 7, dadurch gekennzeichnet, dass die Wände der Kammern aus Stärke bestehen.



Europäisches  
Patentamt

# EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung

EINSCHLÄGIGE DOKUMENTE			EP 93115693.9
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int. Cl.)
X	EP - A - 0 414 462 (UNILEVER) * Seite 11, Zeile 53 - Seite 14, Zeile 40; Anspruch 13; Fig. *	1-6,13	C 11 D 17/04
Y	---	7,8, 11,12	
Y	EP - A - 0 132 792 (DISPO) * Beispiele 1-3 *	7,8, 11,12	
X	EP - A - 0 337 568 (COLGATE-PALOLIVE) * Ansprüche 1-3; Fig. 1 *	1-6,13	
A	EP - A - 0 236 136 (UNILEVER) * Ansprüche; Fig. *	1-6,13	
			RECHERCHIERTE SACHGEBIETE (Int. Cl.)
			C 11 D
Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt.			
Recherchenort WIEN		Abschlußdatum der Recherche 19-11-1993	Prüfer SEIRAFI
<b>KATEGORIE DER GENANNTEN DOKUMENTEN</b> X : von besonderer Bedeutung allein betrachtet Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie A : technologischer Hintergrund O : mündliche Offenbarung P : Zwischenliteratur T : der Erfindung zugrunde liegende Theorien oder Grundsätze E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist D : in der Anmeldung angeführtes Dokument L : aus andern Gründen angeführtes Dokument & : Mitglied der gleichen Patentfamilie, übereinstimmendes Dokument			

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B8C CA

U1S S1306 S1340 S1399 S1427

(56) Documents Cited

GB 2172803 A

GB 2148235 A

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WO 94/07470 A

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ONLINE: EPODOC, JAPIO, TXTE, WPI

(54) Abstract Title

**Injection-moulded capsules**

(57) A capsule is made by injection-moulding from one or more of a range of thermoplastic materials, typically a soluble polyvinylalcohol, and is constructed to dissolve at varying rates in an aqueous environment.

The capsule may have raised or incuse portions moulded into its external surface, which patterns may define a code or simply be rib-like, to assist in its partial dissolution.

The injection-mouldable material can contain one or more particulate solid in order to accelerate the rate of dissolution of the capsule.

It can also be made from materials that will not hold a static charge.

The capsule is for delivering into an aqueous environment substances such as detergents, pesticides, biocides, deodorants, dyes and pigments, and water-treatment chemicals.

GB 2 356 842 A



Fig. 6A

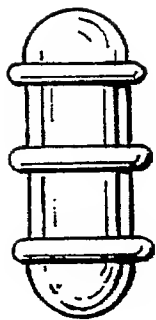


Fig. 6B

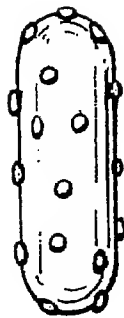


Fig. 6C



Fig. 6D

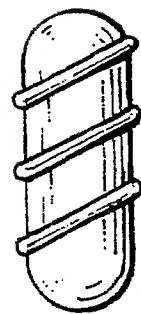


Fig. 6E



Fig. 6F

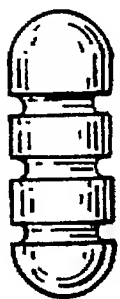


Fig. 6G



Fig. 6H



Fig. 6I

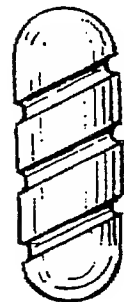


Fig. 6J



Fig. 6K



Fig. 6L



Fig. 6M

Capsule-like containers

This invention is concerned with capsule-like containers, and relates in particular to such containers that may be utilised for the delivery into an aqueous environment of substances such as detergents, pesticides, biocides, deodorants, dyes and pigments, and water-treatment chemicals.

In the Specification of our co-pending Patent Application No: 99/27,144.7 (Publication No: ?,???,???) (P1581) there is described a novel form of capsule useful for the delivery of medical preparations into the Patient. More particularly, there is described, as a replacement for the hard gelatine capsules commonly in use, a novel form of capsule which is injection-moulded and will at least in part dissolve in the body. It has now been appreciated that this type of capsule - one that is injection-moulded, and can at least in part dissolve at the intended use site - has utilisations other than in medicine and the human or animal body. In particular, it has been realised that many substances that must be packaged for delivery to their use site could, where that site is an aqueous environment, be contained in similar, though somewhat larger, capsules. Thus, a capsule-like container - a "capsular" container - could be employed to deliver, for example, detergents to a washing machine, pesticides to a paddy field, or water-treatment chemicals to a reservoir.

In one aspect, therefore, this invention provides a relatively large capsular container that may be utilised

for the delivery of some water-destined ingredient, which capsular container is made of a material that can be injection-moulded and will at least in part dissolve in the intended aqueous destination site.

As discussed further below, the capsular container of the invention will, unless otherwise designed, fully dissolve in the intended aqueous destination site. In so doing, it will release its contents over a desired period of time.

Apart from its size - the capsular container of the invention is relatively larger - the capsular container is very like the capsule of the aforementioned Specification, *mutatis mutandis*. Briefly, though, it may be described as follows:-

The invention provides a capsule - that is to say, a container for the relevant ingredients, which container is in at least two parts (a body part and a cap part) which fit tightly, and preferably sealingly and inseparably, together to form a compartment in which is stored the ingredient to be delivered. In one example, the capsule may have three parts - a body, a first cap, and then a second cap to fit over the closed end of either the body or the first cap, so as to result in a capsule with two separate compartments. And where there are three such parts (or more; four parts - a body and three caps - make three compartments, and so on), then naturally the ingredients in each compartment may be the same or they may be different.

By using capsule cap/body parts of different thicknesses, or of different polymers, or both, this invention enables enhanced control over the release of

different ingredients at different times or in different positions within broad scope of the aqueous destination.

The capsular container is most conveniently of the standard capsule shape - an elongate tubular package with closed, rounded ends - but of course it is relatively larger than the capsule described in the aforementioned Specification. Moreover, although it is possible to have the several parts of much the same sizes, it is usual that there will be a long body with a shorter cap (the cap may be half or a quarter the length of the body). Typically, a capsular container has an overall closed length of 4-10cm (about 2-4in) and an external diameter of 2-4cm (about 0.8-1.7in). However, it should be understood that there is no theoretical limitation, in either size or shape, and what is suitable will normally be decided upon the basis of the "dose" of the container's contents, the size of any aperture the container may have to pass through, and the available means of delivery.

The invention's capsular container is intended to be utilised for the delivery of some ingredient to an aqueous destination. It is clearly necessary that the material from which the capsule is made - the material that can be injection-moulded - should of course be safe for this delivery. PVOH - polyvinylalcohol - is such a material; not only is it non-toxic but it is available in various grades including, where necessary, food-quality grades, and it is very much preferred.

PVOH - or more specifically PVOH-based formulations - is presently the most convenient injection-mouldable, water-soluble or water-dispersible, material, and of the various commercially-available PVOH formulations one particularly-preferred variety is that range of materials

sold (in the form of granules) under the name CP1210T05 by Soltec Developpement SA of Paris, France

In general, PVOH polymers are synthetic materials capable, when appropriately formulated with other adjuvants - such as plasticisers, particularly glycerine (but other glycols and polyglycols may be used), and solids such as talc, stearic acid, magnesium stearate, silicon dioxide, zinc stearate, and colloidal silica - of being moulded at temperatures between 180-220°C, depending upon the formulation selected and the melt flow index required, into capsule bodies and caps of the appropriate hardness, texture and solubility characteristics.

PVOH materials, unlike gelatine, can be modified to dissolve at different rates under varying conditions (including the pH of the aqueous medium into which they are introduced).

The invention provides a capsular container which is in at least two parts (a body part and a cap part) which fit tightly, and preferably sealingly and inseparably, together. The actual joining of the parts can be carried out in any convenient way, but advantage can be taken of the very nature of the capsule material - the fact that it is one that can be injection-moulded (it is a thermoplastic). Thus, the preferred joining method is welding - either heat welding, by melting the parts when they are in contact, and allowing them to "run" into each other and then cool and solidify to become an integral device, or solvent welding, where much the same effect is achieved by partially dissolving the adjacent portions of the capsule and letting them again run into each other and then solidify to form a whole. Heat welding is much the preferred way.

Indeed, in one of its several aspects the invention specifically provides an injection-moulded capsular container having a cap portion and a body portion which, after filling, are welded together into a single indivisible unit (so sealing in and preventing subsequent access to the contents, and thus ensuring containment of the contents, whether powder, granular, liquid, gel or suspension presentations).

PVOH materials are particularly suited to thermal welding, a convenient variety of this technique being laser welding, though any suitable method can be used providing it does indeed make a permanent weld with the polymer used to form the capsule. Some other common methods are infra-red (IR), radio frequency (RF), and ultrasonic welding.

Some of these methods may require the addition of other items or processes to ensure their correct operation. For example, RF welding may require the use of a metal (normally aluminium) conductor in contact with the capsule surface. Laser welding will normally require the top surface to be transparent to the laser used, and the lower surface to be opaque to it. This can be achieved by avoiding opaque coatings and fillers on the outer surface of the capsule cap and by their application to the outer surface of the capsule body. For example, a circumferential line of a suitable material can be printed around the body at the required joining point to facilitate the weld at that point.

Of the various methods, the laser weld is preferred as there is no direct contact required, and it can achieve the very high production speeds required.

After placing the intended contents in the capsule body, and putting the cap on the body, the two portions of the capsule can be welded - by means of a laser beam,

say - into a single unit which cannot thereafter readily and without leaving visible traces be separated into body and cap in order to gain access to the contents. Accordingly, any attempt to tamper with the contents would be clearly obvious.

The two parts of the capsule that are to be welded together are made so that the open end of one will pass into the open end of the other with the smallest gap that can be practically achieved to allow easy assembly. Normally, but not necessarily, the capsule is designed with a stop on one or other component so that the entry of one into the other cannot overrun and stops at the same fixed position in every case.

The two halves or shells are in the closed position when the entire periphery of the open end of one is overlapped by the periphery of the open end of the other. The closed capsule is then ready for welding, and this is done by bringing the capsule into close proximity to the welding head. This distance will vary with the method of welding chosen. The welding equipment is operated, and forms a weld between the two layers in contact in the form of a line of weld in a closed loop around the periphery of the capsule. This can be achieved either by having the welding heads in the form of a ring (which may be continuous or made up of a number of discrete heads), or by rotating one or other of the capsule and the head around the other - say, by rolling the capsule past the head. The exact method will depend on the welding technology chosen.

It is also possible to use solvent welding - that is, using a solvent for the chosen injection-mouldable material so as to soften and render flowable the surface layers of the material where the two parts are in contact. In the PVOH case the solvent is conveniently

water or an aqueous electrolyte solution (typically containing an alkali metal halide such as lithium chloride as the electrolyte). This technique, however, requires another stage to the welding process, in which the solvent is applied to one of the surfaces to be in contact *before* the two shells are closed. This method is not preferred, however, as it is likely to be comparatively slow, and the addition of water and solute may well be detrimental to the ingredient(s) or other preparations contained within the capsule.

Due to the integrity of the welded seal, the capsule can be filled with any appropriate liquid, gel, or oil.

The invention provides a capsule made of a material that can be injection-moulded. The injection-moulding process allows controlled variations in the thickness of the walls and domed ends of either or both halves of the capsule, thereby allowing the release characteristics to be infinitely varied. The use of such moulded capsule shells permits the development of capsule formulations containing controlled-release beads or granules which can determine where the contents are released so that the system as a whole can be made to deliver its contents at the desired position, rate and period of release irrespective of differing physico-chemical properties of the contents.

In its broadest aspect this invention provides a capsular container made of a material that can be injection-moulded. This injection-moulding concept has several unexpected consequences, as does the choice of a polymer of the PVOH type for this purpose. Specifically, an injection-moulded container can be moulded in almost any shape that might be useful (as might have been

inferred from what has been said above). In particular, it can be given external raised (or lowered) areas

In another aspect, therefore, the invention provides a relatively large injection-moulded capsular container having raised portions moulded into its external surface.

The raised portions - for the most part they are referred to hereinafter as "raised", though obviously the effect of a raised part can be achieved by lowering the other parts - can be in the form of short, small pimple-like projections, or they can be ribs that extend wholly or partially either around or along the capsule. The portions may be designed to include or act as markings allowing identification of the capsule and its contents - either visually, by the sighted, or tactilely, by the visually-impaired, or even by a machine or reader. Thus, a code can be moulded into the surface so that a filled capsule can be identified at all stages of its life - by the manufacturer for quality assurance and quality control, by a wholesaler or retailer as part of a stock-control system, and by the User before utilisation, particularly those with vision impairment.

The surface of the capsule needs no pre-treatment prior to printing.

By suitable cutting of the moulds used, any required pattern can be moulded into the surface, either raised or incuse. Both raised and incuse variants bring different properties to the capsules, and the benefits of each are described hereinafter. The complexity of the pattern is limited only by the practical limitations on mould making.

The use of an incuse pattern has a number of interesting possibilities. For example, it can help determine the time of release of the container's

contents. Such an incuse pattern design may include a capsule of standard form but with relatively thick walls. Around the centre section of the capsule base is moulded an array of thin-walled incuse panels. Once the capsule has reached its intended destination, the thin-walled panels in the capsule body quickly dissolve, leaving the capsule with a grid structure of holes. These holes can be small enough to prevent the internal contents leaving the capsule, but large enough to allow the dissolving medium to enter and make contact with the contents of the capsule. As has been described earlier, PVOH materials can, due to variations in molecular weight and extent of hydrolysis, be selected to dissolve at different speeds and at different temperatures in aqueous conditions. Hence, by varying the thickness and the dissolution characteristics of the injection-moulded capsule materials, the body of the capsule may be designed to dissolve or break up at a chosen rate.

Another possibility is to mould a capsule in a relatively sparingly-soluble polymer material - such as a high molecular weight PVOH having a high degree of hydrolysis - with a similar array of holes (rather than thin-walled soluble panels), and then in a separate process, after filling and capping, to cover the area containing the holes with a relatively soluble polymer either by spraying or by shrinking or gluing a soluble sleeve thereover. The relatively-sparingly soluble polymer used in this case could even be an insoluble polymer - provided, of course, that it is injection-mouldable.

Another consequence of using an injection-moulding method is that the mouldable material may easily include one or more additional substance that has some effect on

the way the capsule behaves in use - for instance, on its rate of dissolution.

Thus, in still another aspect the invention provides a relatively-large injection-moulded capsular container that is made from an injection-mouldable material that contains one or more particulate solid in order to accelerate the rate of dissolution of the container.

The simple dissolution of the solid in the chosen medium is sufficient to cause a significant acceleration in the container break-up, particularly so if a gas is also generated, when the physical agitation caused will result in the virtually immediate release of the contents from the container.

Such solids are of course subject to the same limitations of approval and compatibility as before. The most obvious solids for this purpose are the bicarbonate and carbonate salts of the alkali and alkaline-earth metals, typically sodium, potassium, magnesium and calcium.

The solid is very preferably extremely finely divided, typical particle sizes being in the range 1-25 micron, and preferably 5-10 micron.

Other materials that can be utilised to affect the capsule's dissolution rate are most preferably solid acidic substances with carboxylic or sulphonic acid groups or salts thereof. Substances suitable for this purpose are cinnamic acid, tartaric acid, mandelic acid, fumaric acid, maleic acid, malic acid, pamoic acid, citric acid, and naphthalene disulphonic acid, as free acids or as their alkali or alkaline-earth metal salts, with tartaric acid, citric acid, and cinnamic acid in the form of acids or their alkali metal salts being especially preferred.

One of the great practical problems of current hard gelatine capsules is their ability to hold a static electrical charge. Such capsules in production rapidly pick up a high static charge which has the effect of making them not only stick to each other and to all other non-polar surfaces but also making them attract particles of foreign material from their surroundings. It also means that the capsules are hard to fill, and that their surfaces must be treated immediately prior to printing. This phenomenon is common to some mouldable polymers, but not to PVOH, which is not only soluble, ingestible, mouldable and weldable, but in addition will not support a static charge capable of causing the problems described above. So, yet another consequence of using an injection-moulding method is that the mouldable material may be chosen having regard to its ability to pick up and retain a static charge - or may include one or more additional substance that has some effect on the way the capsule behaves in this respect.

Thus, in a still further aspect this invention provides a relatively-large injection-moulded capsular container being made from materials that will not hold a static charge.

The capsule of the invention is one that dissolves in the destined aqueous medium to release its contents therein. The term "dissolve" is used herein in a fairly general sense, to indicate that the capsule crumbles, decomposes, disintegrates or disperses; it need not actually dissolve, although in most cases it will.

Various embodiments of the invention are now described, though by way of illustration only, with reference to the following Examples (and Test Results) and also with reference to the accompanying diagrammatic Drawings in which:

Figures 1A & B show longitudinal cross-sections of a capsular container of the invention in its open and closed states respectively;

Figure 2 shows the closed capsular container of Figure 1B but in see-through perspective;

Figures 3A & B show longitudinal cross-sections of two- and three-compartment capsular containers of the invention;

Figures 4A & B show respectively longitudinal and transverse cross-sections of another two-compartment capsular container of the invention;

Figure 5 shows a section through the wall of a solid-filled polymer capsule of the invention;

Figures 6A-6 show various different forms of moulding on and in the surface of capsular containers of the invention.

Figure 1 shows a two-part, one-compartment capsular container of the invention in its open and its closed form.

The body (11) and cap (12) are to be welded together, and are made so that the open end (11a) of one will pass into the open end (12a) of the other with the smallest gap that can be practically achieved to allow easy assembly. There is a "stop" - a ridge (11b) running all round outside of the body 11 that co-operates with a groove (12b) running all round the inside of the cap 12 - so that the entry of one into the other cannot overrun, and stops at the same fixed position in every case.

When the two halves or shells 11,12 are in the closed position (as in Figure 1B), with the entire periphery of the open end 11a of the body 11 overlapped by the periphery of the open end 12a of the cap 12, the capsular container is ready for welding. The welding equipment (not shown) forms a weld line (13) between the two layers all round the periphery of the container.

Figures 3 and 4 show different sorts of multi-compartment capsular container according to the invention.

In Figure 3 the container is made in two or more parts (three in Figure 3A, four are shown in Figure 3B, but there could be more) - in each case there is a single cap portion (32) and a plurality of body portions (as 31). The outer of the body portions 31 is much the same as an "ordinary" body portion (as in Figure 1), but each inner one is shaped at its "outer" end (as 31c) so that it will fit tightly *inside* the open mouth of the next body portion, much like in Figure 1 the body 11 fits inside the cap 12.

As shown (in Figure 3A), when the first (outer) body part 31 has been filled with product A, it may then be closed by the second (inner) body part 31 within it. That second body part 31 may then be filled with

product B, the cap 32 placed in position, and the three parts welded together at the same time.

Figure 4 shows a capsular container with body (41) and cap (42) two compartments side-by-side (Figure 4B shows a transverse section on the line A-A in Figure 4A). The two compartments can of course hold different products (A and B).

There is theoretically no limit to the number of separate chambers that can be produced either linearly (as in Figure 3) or side by side within the body portion (as in Figure 4). Of course, limitations will be set by practical problems of manufacture.

In Figure 5 there is shown a section through the wall of a solid-filled polymer capsular container of the invention.

Inert solids in powder form have been added to the polymer formulation prior to moulding. This provides a more rigid shell.

Figure 6 etc show various different forms of moulding on the surface of capsular containers of the invention, some in the form of cross-sections.

These are self-evident, and need little comment. Figure 6A,F, for example, shows a capsular container with longitudinal raised ribs, while Figure 6B shows one with lateral (or circumferential) raised ribs and Figure 6E shows one with helical ribs. Figure 6C,H shows a container with raised pimples, while Figure 6D,I shows one with raised identification coding patterns. Figures 6G,J,K,L and M show variants analogous to some of the others, but with *incuse* rather than raised portions.

Claims

1. A relatively-large capsular container that may be utilised for the delivery of some water-destined ingredient, which capsular container is made of a material that can be injection-moulded and will at least in part dissolve in the intended aqueous destination site, and wherein different parts of the container will take different times to dissolve.
2. A capsule as claimed in Claim 1, which has a body and cap each provided with a central axially-parallel partition, so that the capsule as a whole has two separate compartments, or which has three parts - a body, a first cap, and then a second cap to fit over the closed end of either the body or the first cap, so as also to result in a capsule with two separate compartments.
3. A capsule as claimed in either of the preceding Claims which is made of polyvinylalcohol.
4. A capsule as claimed in any of the preceding Claims, wherein the several parts are welded together.
5. A capsule as claimed in any of the preceding Claims, wherein the thickness of the walls and/or ends of the body and/or cap portions are adjusted during moulding to achieve the desired contents release characteristics.
6. A capsule as claimed in any of the preceding Claims, which capsule has relatively-raised portions moulded into its external surface.

7. A capsule as claimed in Claim 6, wherein the raised portions are in the form of short, small pimple-like projections, of ribs that extend wholly or partially either around or along the capsule, and/or of markings allowing identification of the capsule and its contents.

8. A capsule as claimed in either of Claims 6 and 7, wherein the relatively-raised portions provide an incuse pattern design on a capsule of standard form but with relatively thick walls, so forming an array of thin-walled incuse panels such that in use the thin-walled panels quickly dissolve, leaving the capsule with a grid structure of holes.

9. A capsule as claimed in any of Claims 6 to 8, which is moulded in a relatively sparingly-soluble, or even insoluble, polymer material with an array of holes, and then, after filling and capping the capsule, the area containing the holes is covered with a relatively soluble polymer.

10. A capsule as claimed in any of the preceding Claims, which capsule is made from an injection-mouldable material that contains one or more particulate solid in order to accelerate the rate of dissolution of the capsule.

11. A capsule as claimed in Claim 10, wherein the particulate solid has particle sizes in the range 5-10 micron.

12. A capsule as claimed in either of Claims 10 and 11, wherein the particulate sodium, potassium, magnesium or carbonate or bicarbonate, or is tartaric acid, citric acid, and cinnamic acid in the form of the acid or an alkali metal salt thereof.

13. A capsule as claimed in any of the preceding Claims, which capsule is made from materials that will not hold a static charge.

14. A capsule as claimed in any of the preceding Claims and substantially as described hereinbefore.

15. A method of making a capsule as claimed in any of the preceding Claims, which method is substantially as described hereinbefore.



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## Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
 UK Cl (Ed.R): B8C: CA; A5B  
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 Other: Online databases: EPODOC, JAPIO, TXTE, WPI

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Category	Identity of document and relevant passage	Relevant to claims
X,	GB 2172803 A (Standard Telephone Cables plc) Whole document: Water soluble capsules having walls with reduced thickness to give differential solubility	At least claim 1
X,	GB 2148235 A (Warner-Lambert Co.) Whole document: injection moulding of capsules using polymers such as starch, see figures for capsules of varying thickness.	At least claim 1
X,	GB 1298084 A (ERASME) Whole document: manufacture of capsules which are porous and use of PVA as a material for capsule manufacture by injection moulding - see page 1 lines 57, 74-5 & 85-6, page 2 line 119 to page 3 line 24 and Example 7.	At least claim 1
X	WO 9407470 A (Pfizer) Whole document: pharmaceutical compositions having coatings of non-constant thickness and made of PVA	At least claim 1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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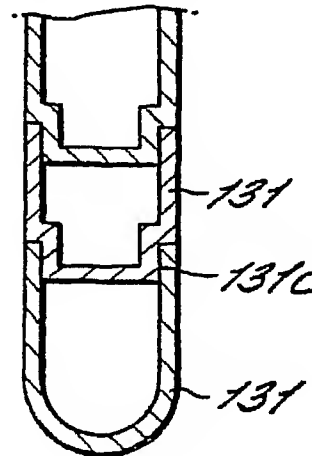
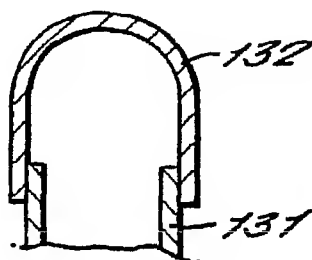
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(54) Title: **INJECTION-MOULDED WATER-SOLUBLE CONTAINER**



(57) Abstract: The present invention provides a moulded rigid, water-soluble container (2, 111, 131, 141) with at least two components of which a substantial part of the surface of these components is water soluble or water dispersible so as to leave perforations throughout the wall when the capsular container (2, 111, 131, 141) is placed in contact with an aqueous environment, wherein the container (2, 111, 131, 141) has one to six compartments, preferably one or two or three, the accessibility time of the various compartments being the same or different from one compartment to another compartment.



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## INJECTION-MOULDED WATER-SOLUBLE CONTAINER

The present invention relates to rigid, water-soluble containers. It also relates to capsules, in particular to capsules that may be utilised for the delivery into Man or other animals of substances such as ingestible ingredients like pharmaceutically- or nutritionally-active materials, that dissolve or disperse within the gastro-intestinal tract, and to capsule-like containers, in particular to such containers that may be utilised for the delivery into an aqueous environment of substances such as detergents, pesticides, biocides, deodorants, dyes and pigments, and water-treatment chemicals.

Clothes washing compositions may be delivered to a clothes washing machine by a delivery tray from which the composition is fed into the washing drum, or they may be placed directly into the washing drum. The washing compositions may be in powder, liquid or block form. Liquid compositions have the disadvantage that they may be spilt. The same applies to powder compositions. Powder compositions have the additional disadvantage that they may produce dust which can be inhaled. These problems are overcome or lessened when blocks of washing composition are used. These are normally individually wrapped. On unwrapping a block, for use, it is still possible that some dust may be produced. Additionally it is an inconvenience for the consumer to have to unwrap the block. Furthermore it is almost impossible for the user to avoid some contact between the block and his or her skin, so leading to a requirement for the user to

- 2 -

wash their hands after starting the washing machine. In fact, all of the methods described involve a risk of contact between the composition and the skin, and it is desirable in all cases for the user to wash their hands  
5 after starting the washing machine. In this context it should be borne in mind that many compositions contain enzymes to assist the cleaning action. Even though the user may tolerate enzyme residues which may be left in clothes after washing, they may still not tolerate  
10 contact between the concentrated washing composition containing the enzymes, and the skin.

Similar considerations apply in relation to other areas including fabric care, surface care and  
15 dishwashing. Thus, in relation in particular to dishwashing compositions, there are also problems of spillage, dust generation, skin contact and inconvenience.

20 It is known to package chemical compositions which may be of a hazardous or irritant nature in water-soluble or water-dispersible materials such as films. The package can simply be added to water in order to dissolve or disperse the contents of the package into the water.

25

For example, WO 89/12587 discloses a package which comprises an envelope of a water-soluble or water-dispersible material which comprises a flexible wall and a water-soluble or water-dispersible heat seal. The  
30 package may contain an organic liquid comprising, for example, a pesticide, fungicide, insecticide or herbicide.

- 3 -

CA-A-1,112,534 discloses a packet made of a water-soluble material in film form enclosing within it a paste-form, automatic dishwasher-compatible detergent  
5 composition. The water-soluble material may be, for example, poly(vinyl alcohol), polyethylene oxide or methyl cellulose.

It is also known to form water-soluble containers by  
10 thermoforming a water-soluble material. For example, WO 92/17382 discloses a package containing an agrochemical such as a pesticide comprising a first sheet of non-planar water-soluble or water-dispersible material and a second sheet of water-soluble or water-dispersible  
15 material superposed on the first sheet and sealed to it by a continuous closed water-soluble or water-dispersible seal along a continuous region of the superposed sheets.

The above methods of packaging have, however, a  
20 number of disadvantages.

The first disadvantage is that they do not have a particularly attractive appearance. In fields such as containers used in the domestic environment, an  
25 attractive appearance for an article is extremely desirable. Liquids contained in envelopes of water-soluble film can have a limp, unattractive appearance.

The second disadvantage is that it is difficult to  
30 form two or more separate compartments in the packaging so that two incompatible components are both enclosed but separated from each other. Although an arrangement has

- 4 -

been described to separate incompatible materials in flexible pouches in WO 93/08095, the method proposed is complex and is not currently achievable in large-scale manufacturing. It cannot, therefore, be used for  
5 producing large numbers of containers.

The third disadvantage is that there is only limited control of the release profile of the compositions held in the containers. For example, when a composition is  
10 held between two planar water-soluble films or in a thermoformed package, the composition is simply released at the time when the films dissolve or disperse in water. While it may be possible to control to a certain extent the timing of the start of release of the contents, there  
15 can be no control over the rate of release of the contents since the entire film dissolves or disperses at about the same time. Furthermore it can be difficult to provide an extended time before the contents of the package are released. An additional problem also arises  
20 with thermoformed packages. If the thermoforming is not carefully controlled there may be inadvertent thinning of the film material at the points where the material is drawn down into the mould when it is thermoformed. This could release the contents of the package early.  
25 Additionally, in all of the above packages, it is not possible to release different compositions at different times or at different rates since, as discussed above, it is not possible to incorporate more than one composition in each water-soluble container.

30

The fourth disadvantage is that the containers cannot be produced at a particularly fast rate. When the

- 5 -

containers are produced by heat-sealing planar films or by thermoforming, the containers have to be immediately filled and sealed. All of these procedures have to be carried out in succession. This means that it is not possible to obtain a quick throughput for mass-market goods such as household products. For example, standard thermoforming machines can only produce around 400 to 800 containers per minute.

There are numerous forms of systems used in the delivery of medical preparations in the market place today. The two most dominant in relation to oral routes are capsules made from hard gelatine, and tablets - the so-called solid dose formulations. Both of these presentations have remained virtually unchanged for decades. Gelatine capsules are made by a dipping process, building up successive layers, while tablets are formed by compressing a powder or fine granules.

The gelatine capsules currently employed are used extensively throughout the world to deliver thousands of prescribed and over-the-counter medications and nutritional formulations. Unfortunately, they have a number of highly significant limitations, these including: their inability easily to be formed into a shape that facilitates the optimum delivery of their ingredients into the Patient; the fact that gelatine is animal-based; and the substantial likelihood of them sticking in the Patient's oesophagus when they are swallowed. In recent years these and other limitations - see below - have been acknowledged, and efforts have been made to overcome them by finding and using a number of

- 6 -

materials as alternatives to gelatine, but in most cases the materials are even more brittle, more difficult to shape, and significantly more expensive than gelatine and other conventional solid dose delivery systems, and  
5 therefore they have not thus far been used successfully for this purpose - which leaves the problem of the hard gelatine capsule, and its disadvantages, still to be solved. Some of these disadvantages are as follows:

10 As noted above, gelatine is animal-based, being extracted from bones and hides, and as such it carries the risk - or, at least, the perceived risk - of being linked with Creutzfeldt-Jakob disease. The manufacturing process used to make hard gelatine capsules involves a  
15 so-called dipping process, which makes thickness parameters difficult to control. More significantly, the process does not lend itself to the more complex shapes, sizes and chemical characteristics now required within the pharmaceutical and nutraceutical industries, more  
20 specifically when controlled release is desirable. Hard gelatine capsules also have an inherent problem of attracting a static charge, which makes their handling during manufacture an additional problem, while the gelatine itself has a tendency to undergo detrimental  
25 physical and chemical changes during long-term storage.

As also pointed out above, gelatine capsules may be rather hard to swallow properly, for they can all too easily stick in the oesophagus. Now, this may seem  
30 trivial, but in fact whilst the most frequent cause of accidents to Patients in hospitals is falling out of bed, the second most frequent cause is capsules or tablets

- 7 -

sticking in the Patient's oesophagus! Very few Patients are able to swallow a capsule when lying down, and when a gelatine capsule sticks in the oesophagus it can be extraordinarily difficult to dislodge. Indeed, it has  
5 been shown that drinking liquids such as water fails to move such a stuck capsule even when taking large amounts, and on occasion even eating food fails to overcome the adhesion. Part of the problem may be that a filled gelatine capsule will float if its contents are not dense  
10 (as is often the case), and will have a tendency to remain in the mouth, after the initial mouthful of water has been swallowed. This allows stickiness rapidly to develop on the surface of the capsule, which in turn increases the probability that the capsule will stick in  
15 the oesophagus when finally swallowed.

It has now been appreciated that the above type of capsule has utilisations other than in medicine and the human or animal body. In particular, it has been  
20 realised that many substances that must be packaged for delivery to their use site could, where that site is an aqueous environment, be contained in similar, though somewhat larger, capsules. Thus, a capsule-like container - a "capsular" container - could be employed to  
25 deliver, for example, detergents to a washing machine, pesticides to a paddy field, or water-treatment chemicals to a reservoir. Moreover, by appropriately dimensioning the various parts of the container, or by suitably selecting the materials from which they are made,  
30 different parts of the container will in use dissolve at different times.

- 8 -

The present invention seeks to provide water-soluble containers which overcome some or all of the above disadvantages.

5       The present invention has a number of different aspects and embodiments as follows:

      The present invention provides a rigid, water-soluble container made of an injection moulded polymer,  
10   for example, a poly(vinyl alcohol) (PVOH) and/or a cellulose ether such as hydroxypropylmethylcellulose (HPMC), which container encases a composition, for example, a fabric care, surface care or dishwashing composition.

15       The present invention also provides a capsule, i.e. a container, comprising a self-supporting receptacle part and a closure part, the receptacle part and the closure part together enclosing a composition, for example a  
20   fabric care, surface care or dishwashing composition, the receptacle part being formed of a water-soluble polymer, and the closure part being formed of a water-soluble polymer, wherein, in use, the closure part dissolves before the receptacle part.

25       The present invention additionally provides an injection-moulded capsule container of any size or shape for the delivery of a water-destined ingredient, preferably selected from a fabric care, surface care or  
30   dishwashing composition, which container is made of a material that will dissolve in the intended aqueous destination site.

- 9 -

The present invention further provides a method of ware washing, comprising use of a container, receptacle or washing capsule as defined above, the method entailing  
5 introducing the container, receptacle or washing capsule into a ware washing machine prior to commencement of the washing process, the container, receptacle or washing capsule being entirely consumed during the washing process. The ware washing machine may, for example, be a  
10 dishwashing or laundry washing machine.

The present invention also provides a capsule container comprising at least two components made of one or more material(s) that can be moulded and which are  
15 water soluble or water dispersible or in which a substantial part of the surface of these components is water soluble or water dispersible so as to leave perforations throughout the wall when the capsular container is placed in contact with an aqueous  
20 environment, wherein the container has one to six compartments, preferably one or two or three, the content of the various compartments being accessible to the aqueous environment when the capsular container is exposed to such an aqueous environment, the accessibility  
25 time of the various compartments being the same or different from one compartment to another compartment. The content of the container may, for example, not be a fabric care, surface care or dishwashing composition.

30 The following description and drawings all relate to each and every aspect and embodiment as discussed above, either singly or in any combination thereof.

- 10 -

The containers of the present invention overcome some or all of the above disadvantages.

5        Firstly, because the containers are rigid and self-supporting, they have an attractive, uniform appearance which does not vary between different containers. Furthermore, the rigid containers can easily have various elements incorporated which are considered to be pleasing  
10       to the eye but which are impossible to incorporate in the flexible containers discussed above.

         Secondly, because the containers are rigid, it is easily possible to introduce two or more compartments, or  
15       have larger compartments separated by walls, to separate mutually incompatible ingredients. The containers can also hold part of the composition on an external surface, for example in an indentation. Furthermore, the container can be moulded in almost any shape that might  
20       be useful. In particular it can be given raised or lowered areas.

         Thirdly, it is possible to control the release profile of the contents of the container. Since the  
25       container is rigid, it is possible to adapt the width of all of the walls of the container to control both the start of release of the composition as well as the rate of release. For example, one or more walls may be made thin in order to have an early release of the  
30       composition. Alternatively all the walls may be thick in order to ensure that there is a delayed release of the composition. The rate of release of the composition may

- 11 -

also be controlled by ensuring that only part of the container has thin walls which are dissolved or dispersed before the remainder of the container. Different walls or parts of walls of the container may be prepared from  
5 different water-soluble polymers which have different dissolution characteristics. For example, a first compartment may be fully enclosed by a polymer such as PVOH which dissolves at a higher or lower temperature than the polymer enclosing a second compartment. Thus  
10 different components can be released at different times. If the container holds a solid or gelled composition, it is not even necessary for the container to fully enclose the composition. A part may be left exposed, so that it immediately begins to dissolve when added to water.

15

Fourthly, since the containers are rigid and self-supporting, they can easily be filled on a production line using normal filling equipment. Such filling equipment is quite capable of filling at least 1500  
20 containers per minute.

Desirably the container, apart from its contents, consists essentially of the injection-moulded polymer. It is possible for suitable additives such as  
25 plasticizers and lubricants to be included. Plasticizers are generally used in an amount of up to 20 wt%, for example from 15 to 20 wt%, lubricants are generally used in an amount of 0.5 to 5% wt% and the polymer is generally therefore used in an amount of 75 to 84.5 wt%,  
30 based on the total amount of the moulding composition. Examples of suitable polymers are PVOH and cellulose ethers such as HPMC.

- 12 -

PVOH is a known water-soluble material which is used to prepare water-soluble films for encasing compositions as discussed above. Cellulose ethers have not in general  
5 been used to prepare water-soluble films because they have poor mechanical strength.

PVOH materials, unlike gelatin, can be modified to dissolve at different rates under various conditions  
10 (including the pH of the aqueous medium into which they are introduced).

The PVOH preferably used to form the container of the present invention may be partially or fully  
15 alcoholised or hydrolysed. For example it may be from 40-100%, preferably 70-92 %, more preferably about 88%, alcoholised or hydrolysed polyvinylacetate. The polymer such as PVOH or cellulose ether is generally cold water (20°C) soluble, but may be insoluble in cold water at  
20 20°C and only become soluble in warm water or hot water having a temperature of, for example, 30°C, 40°C, 50°C or even 60°C. This parameter is determined in the case of PVOH by its degree of hydrolysis.

25 For certain applications or uses, polymers soluble in aqueous environments at temperatures as low as 5°C are also desirable.

In order to ensure that the polymer such as PVOH or  
30 cellulose ether is capable of being injection moulded, it is usual to incorporate components such as plasticizers and mould release agents in an amount of up to, for

- 13 -

example, 15 wt% of the composition. Suitable plasticizers are, for example, pentaerythritol such as depentaerythritol, sorbitol, mannitol, glycerine and glycols such as glycerol, ethylene glycol and  
5 polyethylene glycol.

Solids such as talc, stearic acid, magnesium stearate, silicon dioxide, zinc stearate, and colloidal silica may also be used. A preferred PVOH which is  
10 already in a form suitable for injection moulding is sold in the form of granules under the name CP1210T05 by Soltec Developpement SA of Paris, France.

The PVOH may be moulded at temperatures of, for  
15 example, from 180-220°C, depending upon the formulation selected and the melt flow index required. It can be moulded into containers, capsule bodies, caps, receptacles and closures of the appropriate hardness, texture and solubility characteristics.

20

One of the great practical problems of current hard gelatine capsules is their ability to hold a static electrical charge. Such capsules in production rapidly pick up a high static charge which has the effect of  
25 making them not only stick to each other and to all other non-polar surfaces but also making them attract particles of foreign material from their surroundings. It also means that that the capsules are hard to fill, and that their surfaces must be treated immediately prior to  
30 printing. This phenomenon is common to some mouldable polymers, but not to PVOH, which is not only soluble, ingestible, mouldable and weldable, but in addition will

- 14 -

not support a static charge capable of causing the problems described above. So, yet another consequence of using an injection-moulding method is that the mouldable material may be chosen having regard to its ability to  
5 pick up and retain a static charge - or may include one or more additional substances that has some effect on the way the capsule behaves in this respect.

Thus, in a still further aspect this invention  
10 provides an injection-moulded container such as a receptacle or capsular container made from materials that will not hold a static charge, such as PVOH or a cellulose ether.

15 One aspect of the present invention is, as indicated above, a capsule, i.e. a container, comprising a self-supporting receptacle part and a closure part, the receptacle part and the closure part together enclosing a composition such as a fabric care, surface care or  
20 dishwashing composition, the receptacle part being formed of a water-soluble polymer, and the closure part being formed of a water-soluble polymer, wherein in use, the closure part dissolves before the receptacle part.

25 Preferably the capsule is a washing capsule enclosing a washing composition.

Another aspect of the present invention is, as indicated above, an injection-moulded capsule container  
30 of any size or shape for delivery of a water-destined ingredient, in particular selected from a fabric care, surface care or dishwashing composition, a detergent,

- 15 -

pesticide, biocide, deodorant, dye, pigment or water-treatment chemical, which container is made of a material that will dissolve in the intended aqueous destination site.

5

In many aspects of the present invention, including these aspects, the water-soluble polymer is not limited to PVOH or a cellulose ether. Other water-soluble compounds may be used, such as polyglycolides, gelatine, poly lactides and polylactide-polyglycolide copolymers. These components may also, if necessary, contain components such as plasticizers and mould release agents, such as those described above. All of the polymer compositions, including the PVOH and cellulose ether, may also include other components such as colouring agents and components which modify their properties.

10  
15

In all aspects and embodiments of the present invention, the container or capsule generally comprises a receptacle part which holds the composition and a closure part, which may simply close the receptacle part or may itself have at least some receptacle function. The receptacle part preferably has side walls which terminate at their upper end in an outward flange in which the closure part is sealingly secured, especially if the closure part is in the form of a film. The securement may be by means of an adhesive but is preferably achieved by means of a seal, between the flange and the closure part. Heat sealing may be used or other methods such as infra-red, radio frequency, ultrasonic, laser, solvent, vibration or spin welding. An adhesive such as an

20  
25  
30

- 16 -

aqueous solution of PVOH or a cellulose ether may also be used. The seal is desirably also water-soluble.

5 The closure part may itself be injection moulded or blow moulded. Preferably, however, it is a plastics film secured over the receptacle part. The film may, for example, comprise PVOH or a cellulose ether such as HPMC or another water-soluble polymer.

10 The container walls have thicknesses such that the containers are rigid. For example, the outside walls and any inside walls which have been injection moulded independently have a thickness of greater than 100 $\mu$ m, for example greater than 150 $\mu$ m or greater than 200 $\mu$ m, 300 $\mu$ m, 15 or 500 $\mu$ m, 750 $\mu$ m or 1mm. Preferably, the closure part is of a thinner material than the receptacle part. Thus, typically, the closure part is of thickness in the range 10 to 200  $\mu$ m, preferably 50 to 100  $\mu$ m, and the wall thickness of the receptacle part is in the range 300 to 20 1500  $\mu$ m, preferably 500 to 1000  $\mu$ m. The closure part may, however, also have a wall thickness of 300 to 1500  $\mu$ m, such as 500 to 1000  $\mu$ m.

25 Preferably, the closure part dissolves in water (at least to the extent of allowing the washing composition in the receptacle part to be dissolved by the water; and preferably completely) at 40°C in less than 5 minutes, preferably in less than 2 minutes.

30 The receptacle part and the closure part could be of the same thickness or different thicknesses. The closure

- 17 -

part may, for example, be of higher solubility than the receptacle part, in order to dissolve more quickly.

Preferably, the washing capsule is generally cuboid  
5 in its external shape, with the top wall being formed by the closure part, and with the side walls and base wall being formed by the receptacle part.

Preferably, a washing capsule of the invention is  
10 manufactured by forming an array of receptacle parts, each receptacle part being joined to adjacent receptacle parts, and being separable from them by a snap or tear action. The array is preferably one which has columns and rows of the receptacle parts. The receptacle parts  
15 may be separated by frangible webs of the water-soluble polymer such as PVOH or a cellulose ether.

Alternatively, the receptacle parts may be  
manufactured with the aforementioned flanges, such that  
20 they are separated from each other by a line of weakness. For example the material may be thinner, and so able to be broken or torn readily. The thinness may be a result of the moulding process or, preferably, of a later scoring step.

25

In the manufacturing method, the array, formed by injection moulding, is fed to a filling zone, and all the receptacle parts are charged with the washing composition. A sheet of a water-soluble polymer such as  
30 PVOH or a cellulose ether may then be secured over the top of the array, to form the closure parts for all the receptacle parts of the array. The array may then be

- 18 -

split up into the individual washing capsules, prior to packaging, or it may be left as an array, for packaging, to be split by the user. Preferably, it is left as an array, for the user to break or tear off the individual washing capsules. Preferably, the array has a line of symmetry extending between capsules, and the two halves of the array are folded together, about that line of symmetry, so that closure parts are in face-to-face contact. This helps to protect the closure parts from any damage, between factory and user. It will be appreciated that the closure parts are more prone to damage than the receptacle parts. Alternatively two identical arrays of washing capsules may be placed together with their closure parts in face-to-face contact, for packaging.

In some embodiments of the invention the container, capsule or receptacle part may define a single compartment. In other embodiments of the invention the container, capsule or receptacle part may define two or more compartments, which contain different products useful in a washing process. In such a situation a dividing wall or walls of the compartments preferably terminate at the top of the container, capsule or receptacle part i.e. in the same plane as the top edges of the side walls, so that when the receptacle part is closed by the closure part the contents of the compartments cannot mix. The container, capsule or receptacle part may be provided with an upstand, preferably spaced from the side walls thereof, and preferably of generally cylindrical shape. If wished, the remaining volume of the container, capsule or

- 19 -

receptacle part can be divided into two or more parts by means of walls extending between the upstand and the side walls.

5       The container, capsule, receptacle part or closure may be formed with an opening, for example a depression, formed in the side wall or the base wall, and preferably being open in the outward direction. That is to say, it preferably does not form part of the main volume defined  
10 by the container, capsule, receptacle part or closure. Preferably the opening is adapted to receive, in a press-fit manner, a solid block (for example a tablet) of a composition, for example a material useful in a washing process.

15

Preferably, the closure part is of a transparent or translucent material, so that the contents of the washing capsule can be seen.

20       Preferably, the container, capsule or receptacle part is of a transparent or translucent material, so that the contents of the washing capsule can be seen.

The washing composition within the container,  
25 capsule or receptacle part, or within a compartment thereof, need not be uniform. For example during manufacture it could be fed first with a settable agent, for example a gel, useful in a washing process, and then with a different material. The first material could  
30 dissolve slowly in the washing process so as to deliver its charge over a long period within the washing process. This might be useful, for example, to provide immediate,

- 20 -

delayed or sustained delivery of a softening agent in a clothes washing container, capsule or a receptacle part.

The container, or capsule may, for example, be in at least two parts (a body part and a cap part) which fit tightly, and preferably sealingly and inseparably, together to form a compartment in which is stored the ingredient to be achieved. In one example, the container or capsule may have three parts - a body such as a receptacle, a first cap, and then a second cap to fit over the closed end of either the body or the first cap, so as to result in a capsule with two separate compartments. Where there are three such parts (or more; four parts - a body and three caps - make three compartments, and so on), then naturally the ingredients in each compartment may be the same or they may be different.

In all embodiments of the present invention one compartment may contain, for example, a liquid or solid component (such as a powder, granules or a compressed or gelled tablet) and another may contain a different liquid or solid component (such as a powder, granules or a compressed or gelled tablet). Alternatively, more than one component may be present in one or more compartments. For example a compartment may contain a solid component, for example in the form of a ball or pill (such as a powder, granules or a compressed or gelled tablet), and a liquid component.

30

By using container, receptacle or capsule cap/body parts of different thicknesses, or of different polymers,

- 21 -

or both, such as PVOH polymers with different degrees of hydrolysis, this invention enables enhanced control over the release of different ingredients at different times or in different positions within broad scope of the aqueous destination.

The capsular container can be of any size or shape. It is, for example, conveniently of the standard capsule shape - an elongate tubular package with closed, rounded ends. Moreover, although it is possible to have the several parts of much the same sizes, it is usual that there will be a long body with a shorter cap (the cap may be half or a quarter the length of the body). Typically, a capsular container has an overall closed length of 4 to 10 cm, such as 4 to 6 cm, and an external diameter of 2 to 4 cm. However, it should be understood that there is no theoretical limitation, in either size or shape, and what is suitable will normally be decided upon the basis of the "dose" of the container's contents, the size of any aperture the container may have to pass through, and the available means of delivery.

The capsular container may be in at least two parts (a body or receptacle part and a cap part) which fit tightly, and preferably sealingly and inseparably, together. The actual joining of the parts can be carried out in any convenient way, but advantage can be taken of the very nature of the capsule material - that fact that it is one that can be injection-moulded (it is a thermoplastic). Thus, the preferred joining method is welding, for example either heat welding, by melting the parts when they are in contact, and allowing them to

- 22 -

"run" into each other and then cool and solidify to become an integral device, or solvent welding, where much the same effect is achieved by partially dissolving the adjacent portions of the capsule and letting them again  
5 run into each other and then solidify to form a whole. Heat welding is much the preferred way, although any of the sealing techniques described herein may be used.

Indeed, in one of its several aspects the invention  
10 specifically provides an injection-moulded capsular contained having a cap portion and a body portion which, after filling, are welded together into a single indivisible unit (so sealing in and preventing subsequent access to the contents, and thus ensuring containment of  
15 the contents, whether solid, powder, granular, liquid, gel or suspension presentations).

In another aspect, this invention provides a capsule that may be utilised for the delivery of some active  
20 ingredient or device into the human or animal body, which capsule is made of a material that can be injection-moulded and will at least in part dissolve in the body.

The invention provides a capsule - that is to say, a  
25 small container for the relevant ingredients, which container is in at least two parts (a body part and a cap part) which fit tightly, and preferably sealingly and inseparably, together to form a compartment in which is stored the ingredient to be delivered. As an  
30 alternative, the capsule may have three parts - a body, a first cap, and then a second cap to fit over the closed end of either the body or the first cap, so as to result

- 23 -

in a capsule with two separate compartments. And where there are three such parts (or more; four parts - a body and three caps - make three compartments, and so on), then naturally the ingredients in each compartment may be  
5 the same or they may be different.

In one example - see Figure 11A in the accompanying Drawings - the capsule may have a body and cap each provided with a central axially-parallel partition, so  
10 that the capsule as a whole has two separate compartments.

By using capsule cap/body parts of different thicknesses, or of different polymers, or both, this  
15 invention enables enhanced control over the release of different active ingredients at different times or in different positions. This difference in release time is useful in many applications or uses including within the gastro-intestinal tract, in which the ability to control  
20 release time is of utility in the developing science of chrono-biology.

The capsule is of any shape, preferably an elongate tubular package. The ends are advantageously closed,  
25 whether rounded or conical. Moreover, although it is possible to have the several parts of much the same sizes, it is usual that there will be a long body with a shorter cap (the cap may be half or a quarter the length of the body). Typically, a capsule has an overall closed  
30 length of 10-25mm and an external diameter of 5-10mm for pharmaceutical or nutraceutical use.

- 24 -

Although it is possible to have the several parts of much the same sizes, it is usual that there will be a long body with a shorter cap (the cap may be half or a quarter the length of the body). Typically, a capsular container for applications or uses other than pharmaceutical or nutraceuticals has an overall closed length of 3 to 12 cm, for example 4 to 10 cm and an external diameter of 1 to 5 cm, for example 2 to 4 cm. However, it should be understood that there is no theoretical limitation, in either size or shape, and what is suitable will normally be decided upon the basis of the "dose" of the container's contents, the size of any aperture the container may have to pass through, and the available means of delivery.

15

The invention's capsule is intended to be utilised for the delivery of some active ingredient or device into the human or animal body. The delivery may be by any appropriate route; for most active ingredients the oral route is preferred - and it is when the capsule is administered orally that its advantages are most apparent - but rectal or vaginal routes may of course be employed if appropriate. Regardless of the nature of the route, however, it is clearly necessary that the material from which the capsule is made - the material that can be injection-moulded - should of course be safe for delivery into the target organism (which may be a Human or some other animal). PVOH - polyvinylalcohol - is such a material; not only is it non-toxic but it is available in food-quality grades, and it is very much preferred.

30

- 25 -

PVOH - or more specifically PVOH-based formulations - is presently the most convenient injection-mouldable, water-soluble or water-dispersible, material, and of the various commercially-available PVOH formulations one particularly-preferred variety is that range of materials sold (in the form of granules) under the name CP1210T05 by Soltec Developpement SA of Paris, France

In general, PVOH polymers are synthetic materials capable, when appropriately formulated with other adjuvants - such as plasticisers, particularly glycerine (but other glycols and polyglycols may be used depending upon their acceptability for ingestion), and solids such as talc, stearic acid, magnesium stearate, silicon dioxide, zinc stearate, and colloidal silica - of being moulded at temperatures between 180-220°C, depending upon the formulation selected and the melt flow index required, into capsule bodies and caps of the appropriate hardness, texture and solubility characteristics required of a pharmaceutical or like capsule.

PVOH materials, unlike gelatine, can be modified to dissolve at different rates under varying conditions (including the pH of the aqueous medium - such as the interior parts of the target organism's body - into which they are introduced). Capsules made from PVOH materials can therefore be formulated to release their contents in any desirable location, for example, as far as pharmaceutical use is concerned, in the stomach, the upper or lower small intestine, or the colon, as considered desirable.

- 26 -

Furthermore, PVOH formulations generally do not interact with many organic solvents or oils of the type used in pharmaceutical or nutraceutical compositions, while the aqueous gels often utilised in such  
5 compositions can be formulated to resist interaction with PVOH, so that capsules made from PVOH can be used to contain such materials.

The invention provides a capsule which is in at least two parts (a body part and a cap part) which fit  
10 tightly, and preferably sealingly and inseparably, together. The actual joining of the parts can be carried out in any convenient way, but advantage can be taken of the very nature of the capsule material - the fact that  
15 it is one that can be injection-moulded (it is a thermoplastic). Thus, the preferred joining method is welding - either heat welding, by melting the parts when they are in contact, and allowing them to "run" into each other and then cool and solidify to become an integral  
20 device, or solvent welding, where much the same effect is achieved by partially dissolving the adjacent portions of the capsule and letting them again run into each other and then solidify to form a whole. Heat welding is much the preferred way.

25

Indeed, in one of its several aspects the invention specifically provides an injection-moulded capsule (suitable for use in the delivery of some active ingredient or device) having a cap portion and a body  
30 portion which, after filling, are welded together into a single indivisible unit (so sealing in and preventing subsequent access to the contents, and thus ensuring

- 27 -

containment of the contents, whether granular, liquid, gel or suspension presentations).

PVOH materials are particularly suited to thermal welding, a convenient variety of this technique being laser welding, though any suitable method can be used providing it does indeed make a permanent weld with the polymer used to form the capsule. Some other common methods are infra-red (IR), radio frequency (RF), and ultrasonic welding.

Some of these methods may require the addition of other items or processes to ensure their correct operation. For example, RF welding may require the use of a metal (normally aluminium) conductor in contact with the capsule surface. Laser welding will normally require the top surface to be transparent to the laser used, and the lower surface to be opaque to it. This can be achieved by avoiding opaque coatings and fillers on the outer surface of the capsule cap and by their application to the outer surface of the capsule body. For example, a circumferential line of a suitable material can be printed around the body at the required joining point to facilitate the weld at that point. As a result of the welding, a circumferential weld situation on a planar cross-section of the capsular container is advantageously obtained.

Of the various methods, the laser weld is preferred as there is no direct contact required, and it can achieve the very high production speeds required.

- 28 -

After placing the intended contents in the capsule body, and putting the cap on the body, the two portions of the capsule can be welded - by means of a laser beam, say - into a single unit which cannot thereafter readily  
5 and without leaving visible traces be separated into body and cap in order to gain access to the contents. Accordingly, any attempt to tamper with the contents would be clearly obvious.

10 The two parts of the capsule that are to be welded together are, for example, made so that the open end of one will pass into the open end of the other with the smallest gap that can be practically achieved to allow easy assembly. Normally, but not necessarily, the  
15 capsule is designed with a stop on one or other component so that the entry of one into the other cannot overrun and stops at the same fixed position in every case.

The two halves or shells are in the closed position  
20 when the entire periphery of the open end of one is overlapped by the periphery of the open end of the other. The closed capsule is then ready for welding, and this is done by bringing the capsule into close proximity to the welding head. This distance will vary with the method of  
25 welding chosen. The welding equipment is operated, and forms a weld between the two layers in contact in the form of a line of weld in a closed loop around the periphery of the capsule. This can be achieved either by having the welding heads in the form of a ring (which may  
30 be continuous or made up of a number of discrete heads), or by rotating one or other of the capsule and the head around the other - say, by rolling the capsule past the

- 29 -

head. The exact method will depend on the welding technology chosen.

It is also possible to use solvent welding - that is, using a solvent for the chosen injection-mouldable material so as to soften and render flowable the surface layers of the material where the two parts are in contact. In the PVOH case the solvent is conveniently water or an aqueous electrolyte solution (typically containing an alkali metal halide such as lithium chloride as the electrolyte). This technique, however, requires another stage to the welding process, in which the solvent is applied to one of the surfaces to be in contact before the two shells are closed. This method is not preferred, however, as it is likely to be comparatively slow, and the addition of water and solute may well be detrimental to the ingredient(s) or other preparations contained within the capsule.

The weldability of the two parts (body and cap) of the injection-moulded capsule, of the invention into a single unit which cannot subsequently be separated into its two parts without visibly destroying the capsule is in contrast to the nature of the known hard gelatine capsule parts, which cannot be so welded. Thus, the integrity of the contents can be protected by the invention's capsule in a way which cannot take place using capsule parts made of gelatine.

Due to the integrity of the welded seal, in all aspects and embodiments the container, receptacle or

- 30 -

capsule can be filled with any appropriate powder, liquid, gel, or oil..

The invention provides a capsule, container or  
5 receptacle made of a material that can be injection-  
moulded. The injection-moulding process allows  
controlled variations in the thickness of the walls and  
domed ends of either or both halves of the capsule,  
thereby allowing the release characteristics to be  
10 infinitely varied. The use of such moulded capsule  
shells permits the development of capsule formulations  
containing controlled-release beads or granules which can  
be determined where the contents are released so that the  
system as a whole can be made to deliver its contents at  
15 the desired position, rate and period of release  
irrespective of differing physioco-chemical properties of  
the contents. This also enables the delivery system to  
be used to protect the drug against adverse conditions in  
other parts of the organism - the gastro-intestinal  
20 tract, for example - before absorption occurs if the  
capsule or container is intended for administration to  
the human or animal body.

There are many advantages in the production of  
25 capsules using injection-moulding as compared with the  
traditional dip-coating methods, and it is worth setting  
out a few here.

Dip-coating of gelatine is the traditional method  
30 for the production of capsule shells. One of the  
principal properties of a capsule is the rate at which  
the shell material dissolves or disperses to release the

- 31 -

contained ingredients. Using the dipping process there is only a limited control over the final thickness of the capsule shell. The principal advantage of using the injection-moulding process is that there is much greater  
5 versatility over the final component form, for example:-

- a) The thickness of the wall sections can be more closely controlled, and hence may be varied inter alia to obtain the appropriate dissolution rate of the capsule.
- 10 b) Reduced wall thickness possible with injection-moulded capsule shells will result in increased production rates.
- c) The surface form (smoothness) of both inner and outer capsule surfaces can be more closely  
15 controlled for moulded as compared with dipping, which latter only allows control of the inner surface form.
- d) The degree (tightness) of fit between the two capsule halves can be more closely controlled with  
20 moulding.
- e) Injection-moulding permits the addition of sectional variation around the rim of either or both of the capsule halves, so that features for final capsule assembly, such as ultrasonic or laser welding, can  
25 be included in the basic component design.
- f) If both capsule halves are moulded simultaneously, in the same injection-mould tool, the capsule halves can be assembled automatically as a post-moulding operation carried out immediately the tool halves  
30 open (with benefits for cleanliness and quality assurance).

- 32 -

- g) There are no requirements for further trimming or sizing operations.

The invention provides a capsule for the delivery  
5 into the human or animal body of an active ingredient or device. For the most part the ingredient will, as suggested hereinbefore, be a drug - a pharmaceutically-active substance - or perhaps some sort of nutritionally-active material - a "nutraceutically-active" material -  
10 such as vitamins or oligo-elements or food supplements. However, it is not impossible for this capsule to be used for the delivery of quite a different sort of "ingredient" - for example, a measuring or sampling device, or machine, as might be required in some forms of  
15 medicine or surgery.

In its broadest aspect this invention provides a capsule made of a material that can be injection-moulded. This injection-moulding concept has several unexpected  
20 consequences, as does the choice of a polymer of the PVOH type for this purpose. Specifically, an injection-moulded capsule can be moulded in almost any shape that might be useful (as might have been inferred from what has been said above). In particular, it can be given  
25 external raised (or lowered) areas - this has the advantage that, for the preferred orally delivery route, it significantly reduces the surface area of the capsule that is able to come into contact with the walls of the oesophagus as the capsule is being swallowed, and thereby  
30 reduces the risk of the capsule sticking in the oesophagus, and thus facilitates the passage of the capsule down into the stomach.

- 33 -

In another aspect, therefore, the invention provides an injection-moulded capsule (suitable for use in the delivery of some active ingredient or device) having  
5 raised portions moulded into its external surface.

Thus the container, capsule, capsular container, receptacle or closure may, for example, have raised portions moulded into its external surface.

10

The raised portions - for the most part they are referred to hereinafter as "raised", though obviously the effect of a raised part can be achieved by lowering the other parts - can be in the form of short, small pimple-  
15 like projections, or they can be ribs that extend wholly or partially either around or along the capsule. The portions may be designed to include or act as markings allowing identification of the capsule and its contents - either visually, by the sighted, or tactilēly, by the  
20 visually-impaired, or even by a machine or reader. Thus a code can be moulded into the surface so that a filled capsule can be identified at all stages of its life - by the manufacturer for quality assurance and quality control, by a wholesaler or retailer as part of a stock-  
25 control system, and by the user before utilisation, particularly those with vision impairment.

The surface of the capsule, container, receptacle or closure needs no pre-treatment prior to printing.

30

By suitable cutting of the moulds used, any required pattern can be moulded into the surface, either raised or

- 34 -

incuse. Both raised and incuse variants bring different properties to the capsule, and the benefits of each are described hereinafter. The complexity of the pattern is limited only by the practical limitations on mould making.

Thinner areas of the walls of different compartments of the capsular container are preferably disposed longitudinally according to the general elongated shape of the capsular container.

The use of an incuse pattern has a number of interesting possibilities. For example, for sparingly-soluble drugs delivered orally, the gastro-intestinal transit from mouth to rectum is often too short to allow the active ingredient of some orally-delivered medicament to be absorbed, with the consequence that most of the drug is excreted, and so wasted. However, incuse moulding in a suitable pattern provides a way of converting the capsule - in, say, the acidic conditions prevailing in the stomach - from an integral, sealed, container to a perforate container from which the contents of the capsule can readily escape as a solution or suspension (rather like a tea bag, or a metal tea infuser).

Such an incuse pattern design may include a capsule of standard form but with relatively thick walls. Around a suitable section of the capsule is moulded an array of thin-walled incuse panels. Once the capsule has reached the stomach, the thin-walled panels in the capsule body quickly dissolve, leaving the capsule with a grid

- 35 -

structure of holes. These holes can be small enough to prevent the internal contents leaving the capsule, but large enough to allow the dissolving medium to enter and make contact with the contents of the capsule. As has  
5 been described earlier, PVOH materials can, due to variations in molecular weight and extent of hydrolysis, be selected to dissolve at different speeds and at different temperatures in aqueous conditions. Hence, by varying the thickness and the dissolution characteristics  
10 of the injection-moulded capsule materials, the body of the capsule may be designed to dissolve or break up at a chosen rate especially in the stomach. Once the capsule has dissolved or broken up, the beads or granules are released but only after being retained in the stomach for  
15 an extended period of up to 12 hours. As long as such capsules with holes remain intact, they do not pass through the pyloric sphincter into the duodenum until the housekeeper wave is in operation.

20 More generally for applications or uses outside of washing, the difference of accessibility time to an aqueous environment from one compartment to another is in the range of 1 minute to 12 hours at the same temperature in the range of 5°C to 95°C.

25

Another possibility is to mould a capsule in a relatively sparingly-soluble polymer material - such as a high molecular weight PVOH having a high degree of hydrolysis - with a similar array of holes (rather than  
30 thin-walled soluble panels), and then in a separate process, after filling and capping, to cover the area containing the holes with a relatively soluble polymer

- 36 -

either by spraying or by shrinking or gluing a soluble sleeve thereover. It should be noted that in use such a "covered" perforate capsule may either break up in the gastro-intestinal tract after being swept from the stomach, thereby releasing its ingredients, or it may carry on to leave the body in the faeces while still containing the active-ingredient-carrying beads or granules (though these have by then been relieved of most of the active-ingredient content). The relatively-sparingly soluble polymer used in this case could even be an insoluble polymer - provided, of course, that it is both injection-mouldable and tolerated by the body.

By this means, such a capsule of outer diameter between 3 and 6 mm may contain, for example, a plurality of beads slightly larger than the holes which will be formed in the capsule and on which the finely-divided sparingly-soluble drug is layered. The drug dissolves only slowly in the acid conditions prevailing in the stomach. The capsule, because of its size, can be retained in the stomach and thus allow the release in solution form of the drug for absorption in the stomach and gastro-intestinal tract. In this way, the absorption of the sparingly soluble drug in the gastro-intestinal tract will be increased as the beads are held for a longer time in the stomach than they would be if released from a gelatine capsule that rapidly dissolves with the result that the beads pass quickly from the stomach into the small intestine. In the "fed state", units of dimensions greater than 3mm do not pass through the pyloric sphincter into the duodenum as long as there are contents in the stomach. Thus, if such a PVOH capsule is

- 37 -

taken with the breakfast meal, it will be retained in the stomach until after the evening meal if a normal midday meal was taken. If the capsule has not dissolved or broken up in the stomach, it will be swept from the  
5 stomach into the large intestine where it may either dissolve or break up or be eliminated from the body in the faeces. The overall result is an increased transit time of the drug delivery system from mouth to faeces, and thus increased bio-availability for sparingly-soluble  
10 drugs.

The capsule which either contains or develops holes while keeping its integrity can also be used advantageously to retain in the stomach beads containing  
15 soluble drugs and possessing controlled-release membranes programmed to take advantage of the better absorption of such drugs in the small intestine rather than the large intestine, and thereby to give a constant rate of systemic drug input.

20

These hole-containing or hole-developing capsules can be used to release two or more drugs at designated regions each at a controlled relative rate even if the drugs in conventional form have different rates of drug  
25 absorption or metabolism in different regions of the gastro-intestinal tract.

Whilst the oral route is preferred for many of the drug applications envisaged using the capsules of the  
30 invention, the rectal and vaginal routes, particularly those utilising perforate capsules which produce holes *in vivo*, are also important.

- 38 -

The oral route is suitable generally for sparingly-soluble drugs, and for good control of drug input and activation location.

5

The rectal route is particularly appropriate for use with perforate capsules that produce holes *in vivo*, together with controlled-release drug-carrying beads or granules. This allows the avoidance of "first pass metabolism" -- some drugs are especially sensitive to this when administered orally. The perforate capsule can deliver the drug at a controlled rate via its location in the rectum so that the drug, unlike the delivery from a suppository, is released locally from the beads or granules in the capsule to give a steady, localised, input into the lower haemorrhoidal vein (unlike the higher medium and upper haemorrhoidal veins, which deliver blood to the liver, this allows systemic delivery without "first pass metabolism" by the liver). If they were not contained in the capsule, the beads would move upwards into the descending colon, and so would supply their drug content mainly to the medial and upper haemorrhoidal veins. Thus, using the rectal route with a perforate capsule, a drug can be delivered to a Patient in a similar but more acceptable manner to that achieved by intravenous infusion.

The vaginal route with a perforate capsule facilitates drug delivery at a constant rate followed by cessation when the system is withdrawn from the body aperture at the designated time.

From the above examples, other more selective approaches can be developed to maximise and control the rate of drug input by the chosen route of product use, thereby offering solutions to many current problems of drug delivery in man and other animals.

Another consequence of using an injection-moulding method is that the mouldable material may easily include one or more additional substance that has some effect on the way the capsule behaves in use - for instance, on its surface properties (and specifically on its tackiness, or stickiness), or on its rate of dissolution.

Thus, in yet another aspect the invention provides an injection-moulded capsule (suitable for use in the oral delivery of some active ingredient or device) that is made from an injection-mouldable material that contains one or more particulate hydrophobic solid in order to both reduce the surface tackiness and also increase the density of the capsule, which effects will reduce the risk of the capsule sticking in the oesophagus.

This meets one of the problems of current hard gelatine capsules - and of those made of any other water soluble polymer - namely that upon insertion in the mouth the capsule comes in contact with water, which will begin the softening process prior to dissolving and lead to a stickiness of the surface which can cause problems and interruptions (sometimes leading to release of its contents in the oesophagus) on the capsule's path through the oesophagus to the stomach. As noted, reduction of

- 40 -

this stickiness can be achieved by modifying the mouldable polymer formulation by the addition of inert solids in powder form - though naturally the added solids have to be approved for ingestion, and must be compatible with  
5 the medical preparation contained within the capsule.

This use of added solids provides a more rigid capsule shell with a surface less immediately affected by the aqueous content of the mouth or oesophagus, thereby  
10 reducing surface tackiness during the initial swallowing.

In this aspect - the incorporation of a particulate solid to influence tackiness - the solid is very preferably extremely finely divided, typical particle  
15 sizes being in the range 1-50 micron, and preferably 5-10 micron. The upper limit is generally a practical one for the moulding process, but with increasing solid particle size the capsule surface will be to a greater extent made up of the insoluble solid ingredient and to a  
20 lesser extent the polymer (which will be partially concealed below the contact surface with the oesophagus).

Materials that can be utilised to reduce the capsule's surface tackiness are most preferably insoluble  
25 and preferably hydrophobic. Substances suitable for this purpose are talc, stearic acid, magnesium stearate, zinc stearate, sodium stearate, colloidal silica and magnesium trisilicate, with talc and magnesium stearate being especially preferred.

30

And in still another aspect the invention provides an injection-moulded capsule (suitable for use in the

- 41 -

oral delivery of some active ingredient or device) that is made from an injection-mouldable material that contains one or more particulate solid in order to accelerate the rate of dissolution of the capsule, for  
5 example in the different conditions of pH which exist in the gastro-intestinal tract.

Unlike gelatine capsules, which sometimes release their contents prematurely (especially in elderly  
10 patients) when they stick in the oesophagus and open, capsules of PVOH (in particular) can be formulated so that they do not open in the oesophagus but release their contents only where necessary - ie, when they reach the relevant target area.

15

The particulate solid incorporated into the injection mix may be a material that is barely affected in a non-acidic medium but dissolves relatively rapidly in an acidic environment, so as to allow the capsule to  
20 release its contents, for example in the stomach. Alternatively, the solid material may be one that is relatively insoluble in an acidic medium but relatively soluble in a neutral environment, so as to allow release of the capsule's contents, for example in the lower small  
25 intestine and in the colon.

The simple dissolution of the solid in the chosen medium is sufficient to cause a significant acceleration in the capsule break-up, particularly so when a gas is  
30 also generated, when the physical agitation caused will result in the virtually immediate release of the contents from the capsule.

- 42 -

Such solids are of course subject to the same limitations of approval and compatibility as before. The solids which can be used for accelerating the rate of dissolution of the capsular container are preferably the bicarbonate and carbonate salts of the alkali and alkaline-earth metals, typically sodium, potassium, magnesium and calcium, all of which salts may liberate carbon dioxide gas for the purpose of generating effervescence.

The solid is very preferably extremely finely divided, typical particle sizes being in the range 1-25 micron, and preferably 5-10 micron.

Materials that can be utilised to affect the capsule's dissolution rate in a non-acid medium (for example, the lower intestine or the colon) but without being affected by an acid medium (for example, the stomach) are most preferably solid acidic substances with carboxylic or sulphonic acid groups or salts thereof. Substances suitable for this purpose are cinnamic acid, tartaric acid, mandelic acid, fumaric acid, maleic acid, malic acid, pamoic acid, citric acid, and naphthalene disulphonic acid, as free acids or as their alkali or alkaline-earth metal salts, with tartaric acid, citric acid, and cinnamic acid in the form of acids or their alkali metal salts being especially preferred.

One of the great practical problems of current hard gelatine capsules is their ability to hold a static electrical charge. Such capsules in production rapidly

- 43 -

pick up a high static charge which has the effect of making them not only stick to each other and to all other non-polar surfaces but also making them attract particles of foreign material from their surroundings. It also  
5 means that the capsules are hard to fill, and that their surfaces must be treated immediately prior to printing.

This phenomenon is common to some mouldable polymers, but not to PVOH, which is not only soluble,  
10 ingestible, mouldable and weldable, but in addition will not support a static charge capable of causing the problems described above. So, yet another consequence of using an injection-moulding method is that the mouldable material may be chosen having regard to its ability to  
15 pick up and retain a static charge - or may include one or more additional substance that has some effect on the way the capsule behaves in this respect.

Thus, in a still further aspect this invention  
20 provides an injection-moulded capsule (suitable for use in the delivery of an active ingredient or device into the human or animal body) being made from materials that will not hold a static charge.

25 The capsule of the invention is one that, utilised for the delivery of some active ingredient or device into the human or animal body, dissolves in the body to release its contents therein. The term "dissolve" is used herein in a fairly general sense, to indicate that  
30 the capsule crumbles, decomposes, disintegrates or disperses; it need not actually dissolve, although most often it will.

- 44 -

Another possibility is to mould a capsule, container or receptacle in a relatively sparingly-soluble polymer material - such as a high molecular weight PVOH having a high degree of hydrolysis - with a similar array of holes (rather than thin-walled soluble panels), and then in a separate process, after filling and capping, to cover the area containing the holes with a relatively soluble polymer either by spraying or by shrinking or gluing a soluble sleeve thereover. The relatively-sparingly soluble polymer used in this case could even be an insoluble polymer - provided, of course, that it is injection-mouldable.

Another consequence of using an injection-moulding method is that the mouldable material may easily include one or more additional substance that has some effect on the way the capsule behaves in use - for instance, on its rate of dissolution.

20

Thus, in still another aspect the invention provide a container, for example, relatively-large injection-moulded capsular container, receptacle, capsule or closure that is made from an injection-mouldable material that contains one or more particulate solid in order to accelerate the rate of dissolution of the container. This solid may also be present in the contents of the container, receptacle or capsule.

30

The simple dissolution of the solid in the chosen medium is sufficient to cause a significant acceleration in the container break-up, particularly so if a gas is

- 45 -

also generated, when the physical agitation caused will result in the virtually immediate release of the contents from the container.

5           The most obvious solids for this purpose are the bicarbonate and carbonate salts of the alkali and alkaline-earth metals, typically sodium, potassium, magnesium and calcium.

10           The solid is very preferably extremely finely divided, typical particle sizes being the range 1 to 25  $\mu\text{m}$ , and preferably 5 to 10  $\mu\text{m}$ .

Other materials that can be utilised to affect the capsule's dissolution rate are most preferably solid  
15   acidic substances with carboxylic or sulphonic acid groups or salts thereof. Substances suitable for this purpose are cinnamic acid, tartaric acid, mandelic acid, fumaric acid, maleic acid, malic acid, pamoic acid,  
20   citric acid and naphthalene disulphonic acid, as free acids or as their alkali or alkaline-earth metal salts, with tartaric acid, citric acid, and cinnamic acid in the form of acids or their alkali metal salts being especially preferred.

25

The container or capsule of the present invention may contain any composition which is intended to be released when the container is placed in an aqueous environment.

30

Thus it may, for example, contain a fabric care, surface care or dishwashing composition. A fabric care

- 46 -

composition is any composition which is used in the field of fabric care, such as in a fabric washing, fabric treating or dyeing process. A surface care composition is any composition which is used in the field of surface  
5 care, for example to clear, treat or polish a surface. Suitable surfaces are, for example, household surfaces such as worktops, as well as surfaces of sanitary ware, such as sinks, basins and lavatories. A dishwashing composition is any composition which is used in the field  
10 of dishwashing, such as a dishwashing, water-softening or rinse aid composition.

Examples of such compositions are a dishwashing, water-softening, laundry, detergent and rinse-aid  
15 compositions. In this case the composition is especially suitable for use in a domestic washing machine such as a clothes washing machine or dishwashing machine. Other examples are disinfectant, antibacterial and antiseptic composition, for example those intended to be diluted  
20 with water before use, or a concentrated refill composition, for example for a trigger-type spray used in domestic situations. Such a composition can simply be added to water already held in the spray container.

25 The container may be used to contain any composition. Desirably the composition has a mass of at least 10 g or 15 g, for example, from 10 g or 15 g to 100 g, especially from 10 g to 15 g to 40 g. For example, a dishwashing composition may weigh from 10 g or  
30 15 g to 20 g, a water-softening composition may weigh from 25 g to 35 g, and a laundry composition may weigh from 10 g to 40 g, 20 g to 40 g or 30 g to 40 g.

- 47 -

The container may also contain, for example, a detergent, pesticide, biocide, deodorant, dye, pigment or water-treatment chemical. It may, for example, deliver  
5 detergents or water-treatment chemicals to a washing machine.

For pharmaceutical or nutraceutical applications or uses, the typical mass of the contents of the capsular  
10 container is in the range of 10 mg to 15 g, preferably 50 mg to 1 g.

For uses other than pharmaceutical, nutraceutical or washing, the typical mass of the contents of the capsular  
15 container is in the range of 1 g to 100 g, preferably 2 g to 50 g.

In general, particularly when used in a domestic environment, the maximum dimension of the container is 5  
20 cm. For example, a cuboid container may have a length of 1 to 5 cm, especially 3.5 to 4.5 cm, a width of 1.5 to 3.5 cm, especially 2 to 3 cm, and a height of 1 to 2 cm, especially 1.25 to 1.75 cm.

25 The composition contained by the capsule may be, for example, any which is suitable for the designated application, for example a clothes washing or dishwashing application. It may be a powder or a liquid but if a liquid, may be a low water formulation, preferably having  
30 a maximum water content of 5 wt%, in order to maintain the integrity of the walls of the capsule or a higher water formulation containing, for example, at least 8 wt%

- 48 -

water. The composition may be formulated having regard to the fact that the user will not come into contact with the composition, whether by inhalation or by skin contact. For example, the composition may include an enzyme, without concern about physical contact between the composition containing the enzyme, and the user.

If the container contains an aqueous liquid having a relatively high water content, it may be necessary to take steps to ensure the liquid does not attack the water-soluble polymer if it is soluble in cold water (20°C), or water at a temperature of up to, say, 35°C. Steps may be taken to treat the inside surfaces of the container, for example by coating it with agents such as PVdC (poly(vinylidene chloride)) or PTFE (polytetrafluoroethylene), or to adapt the composition to ensure that it does not dissolve the polymer. For example, it has been found that ensuring the composition has a high ionic strength or contains an agent which minimises water loss through the walls of the container will prevent the composition from dissolving the polymer from the inside. This is described in more detail in EP-A-518,689 and WO 97/27743.

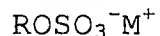
The composition held within the container depends, of course, on the intended use of the composition. It may, for example, contain surface active agents such as an anionic, non-ionic, cationic, amphoteric or zwitterionic surface active agent or mixture thereof.

Examples of anionic surfactants are straight-chained or branched alkyl sulfates and alkyl polyalkoxylated

- 49 -

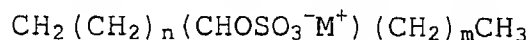
sulfates, also known as alkyl ether sulfates. Such surfactants may be produced by the sulfation of higher C<sub>8</sub>-C<sub>20</sub> fatty alcohols.

5        Examples of primary alkyl sulfate surfactants are those of formula:



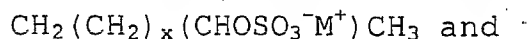
wherein R is a linear C<sub>8</sub>-C<sub>20</sub> hydrocarbyl group and M is a water-solubilising cation. Preferably R is C<sub>10</sub>-C<sub>16</sub> alkyl,  
10    for example C<sub>12</sub>-C<sub>14</sub>, and M is alkali metal such as lithium, sodium or potassium.

Examples of secondary alkyl sulfate surfactants are those which have the sulfate moiety on a "backbone" of  
15    the molecule, for example those of formula:

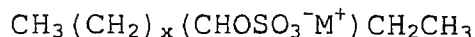


wherein m and n are independently 2 or more, the sum of m+n typically being 6 to 20, for example 9 to 15, and M is a water-solubilising cation such as lithium, sodium or  
20    potassium.

Especially preferred secondary alkyl sulfates are the (2,3) alkyl sulfate surfactants of formulae:



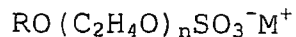
25



for the 2-sulfate and 3-sulfate, respectively. In these formulae x is at least 4, for example 6 to 20, preferably  
30    10 to 16. M is cation, such as an alkali metal, for example lithium, sodium or potassium.

- 50 -

Examples of alkoxyated alkyl sulfates are ethoxylated alkyl sulfates of the formula:



5

wherein R is a C<sub>8</sub>-C<sub>20</sub> alkyl group, preferably C<sub>10</sub>-C<sub>18</sub> such as a C<sub>12</sub>-C<sub>16</sub>, n is at least 1, for example from 1 to 20, preferably 1 to 15, especially 1 to 6, and M is a salt-forming cation such as lithium, sodium, potassium, ammonium, alkylammonium or alkanolammonium. These compounds can provide especially desirable fabric cleaning performance benefits when used in combination with alkyl sulfates.

15

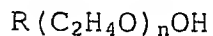
The alkyl sulfates and alkyl ether sulfates will generally be used in the form of mixtures comprising varying alkyl chain lengths and, if present, varying degrees of alkoxylation.

20

Other anionic surfactants which may be employed are salts of fatty acids, for example C<sub>8</sub>-C<sub>18</sub> fatty acids, especially the sodium potassium or alkanolammonium salts, and alkyl, for example C<sub>8</sub>-C<sub>18</sub>, benzene sulfonates.

25

Examples of nonionic surfactants are fatty acid alkoxyates, such as fatty acid ethoxyates, especially those of formula:



30

wherein R is a straight or branched C<sub>8</sub>-C<sub>16</sub> alkyl group, preferably a C<sub>9</sub>-C<sub>15</sub>, for example C<sub>10</sub>-C<sub>14</sub>, or C<sub>12</sub>-C<sub>14</sub> alkyl

- 51 -

group and n is at least 1, for example from 1 to 16, preferably 2 to 12, more preferably 3 to 10.

The alkoxyated fatty alcohol nonionic surfactant  
5 will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17, more preferably from 6 to 15, most preferably from 10 to 15.

Examples of fatty alcohol ethoxylates are those made  
10 from alcohols of 12 to 15 carbon atoms and which contain about 7 moles of ethylene oxide. Such materials are commercially marketed under the trademarks Neodol 25-7 and Neodol 23-6.5 by Shell Chemical Company. Other useful Neodols include Neodol 1-5, an ethoxylated fatty  
15 alcohol averaging 11 carbon atoms in its alkyl chain with about 5 moles of ethylene oxide; Neodol 23-9, an ethoxylated primary C<sub>12</sub>-C<sub>13</sub> alcohol having about 9 moles of ethylene oxide; and Neodol 91-10, an ethoxylated C<sub>9</sub>-C<sub>11</sub> primary alcohol having about 10 moles of ethylene oxide.

20

Alcohol ethoxylates of this type have also been marketed by Shell Chemical Company under the Dobanol trademark. Dobanol 91-5 is an ethoxylated C<sub>9</sub>-C<sub>11</sub> fatty alcohol with an average of 5 moles ethylene oxide and  
25 Dobanol 25-7 is an ethoxylated C<sub>12</sub>-C<sub>15</sub> fatty alcohol with an average of 7 moles of ethylene oxide per mole of fatty alcohol.

Other examples of suitable ethoxylated alcohol  
30 nonionic surfactants include Tergitol 15-S-7 and Tergitol 15-S-9, both of which are linear secondary alcohol ethoxylates available from Union Carbide Corporation.

- 52 -

Tergitol 15-S-7 is a mixed ethoxylated product of a C<sub>11</sub>-C<sub>15</sub> linear secondary alkanol with 7 moles of ethylene oxide and Tergitol 15-S-9 is the same but with 9 moles of ethylene oxide.

5

Other suitable alcohol ethoxylated nonionic surfactants are Neodol 45-11, which is a similar ethylene oxide condensation products of a fatty alcohol having 14-15 carbon atoms and the number of ethylene oxide groups per mole being about 11. Such products are also available from Shell Chemical Company.

Further nonionic surfactants are, for example, C<sub>10</sub>-C<sub>18</sub> alkyl polyglycosides, such as C<sub>12</sub>-C<sub>16</sub> alkyl polyglycosides, especially the polyglucosides. These are especially useful when high foaming compositions are desired. Further surfactants are polyhydroxy fatty acid amides, such as C<sub>10</sub>-C<sub>18</sub> N-(3-methoxypropyl) glycamides and ethylene oxide-propylene oxide block polymers of the Pluronic type.

Examples of cationic surfactants are those of the quaternary ammonium type.

Examples of amphoteric surfactants are C<sub>10</sub>-C<sub>18</sub> amine oxides and the C<sub>12</sub>-C<sub>18</sub> betaines and sulfobetaines.

The total content of surfactants in the laundry or detergent composition is desirably 60 to 95 wt%, especially 75 to 90 wt%. Desirably an anionic surfactant is present in an amount of 50 to 75 wt%, the nonionic surfactant is present in an amount of 5 to 20 wt%, the

- 53 -

cationic surfactant is present in an amount of from 0 to 10 wt% and/or the amphoteric surfactant is present in the amount of from 0 to 10 wt%. These amounts are based on the total solids content of the composition, i.e.

5 excluding the water when present.

Dishwasher compositions usually comprise a detergency builder. Suitable builders are alkali metal or ammonium phosphates, polyphosphates, phosphonates, polyphosphonates, carbonates, bicarbonates, borates, polyhydroxysulfonates, polyacetates, carboxylates such as citrates and other polycarboxylates. The builder is desirably present in an amount of up to 90 wt%, preferably 15 to 90 wt%, more preferably 15 to 75 wt%, relative to the total weight of the composition. Further details of suitable components are given in, for example, EP-A-694,059, EP-A-518,720 and WO 99/06522.

The compositions, particularly when used as laundry washing or dishwashing compositions, may also comprise enzymes, such as protease, lipase, amylase and cellulase enzymes. Such enzymes are commercially available and sold, for example, under the registered trade marks Esperase, Alcalase, Savinase, Termamyl, Lipolase and Celluzyme by Nova Nordisk A/S. Desirably the enzymes are present in the composition in an amount of from 0.5 to 3 wt%, especially 1 to 2 wt%.

The compositions may, if desired, comprise a thickening agent or gelling agent. Suitable thickeners are polyacrylate polymers such as those sold under the trade mark CARBOPOL, or the trade mark ACUSOL by Rohm and

- 54 -

Hass Company. Other suitable thickeners are xanthan gums. The thickener, if present, is generally present in an amount of from 0.2 to 4 wt%, especially 0.2 to 2 wt%.

5       The compositions can also optionally comprise one or more additional ingredients. These include conventional detergent composition components such as further surfactants, bleaches, bleach enhancing agents, builders, suds boosters or suds suppressors, anti-tarnish and anti-  
10 corrosion agents, organic solvents, co-solvents, phase stabilisers, emulsifying agents, preservatives, soil suspending agents, soil release agents, germicides, phosphates such as sodium tripolyphosphate or potassium tripolyphosphate, pH adjusting agents or buffers, non-  
15 builder alkalinity sources, chelating agents, clays such as smectite clays, enzyme stabilizers, anti-limescale agents, colourants, dyes, hydrotropes, dye transfer inhibiting agents, brighteners, and perfumes. If used, such optional ingredients will generally constitute no  
20 more than 10 wt%, for example from 1 to 6 wt%, the total weight of the compositions.

The builders counteract the effects of calcium, or other ion, water hardness encountered during laundering  
25 or bleaching use of the compositions herein. Examples of such materials are citrate, succinate, malonate, carboxymethyl succinate, carboxylate, polycarboxylate and polyacetyl carboxylate salts, for example with alkali metal or alkaline earth metal cations, or the  
30 corresponding free acids. Specific examples are sodium, potassium and lithium salts of oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids, C<sub>10</sub>-C<sub>22</sub> fatty

- 55 -

acids and citric acid. Other examples are organic phosphonate type sequestering agents such as those sold by Monsanto under the trade mark Dequest and alkylhydroxy phosphonates. Citrate salts and C<sub>12</sub>-C<sub>18</sub> fatty acid soaps  
5 are preferred.

Other suitable builders are polymers and copolymers known to have builder properties. For example, such materials include appropriate polyacrylic acid,  
10 polymaleic acid, and polyacrylic/polymaleic and copolymers and their salts, such as those sold by BASF under the trade mark Sokalan.

The builders generally constitute from 0 to 3 wt%,  
15 more preferably from 0.1 to 1 wt%, by weight of the compositions.

Compositions which comprise an enzyme may optionally contain materials which maintain the stability of the  
20 enzyme. Such enzyme stabilizers include, for example, polyols such as propylene glycol, boric acid and borax. Combinations of these enzyme stabilizers may also be employed. If utilized, the enzyme stabilizers generally constitute from 0.1 to 1 wt% of the compositions.

25

The compositions may optionally comprise materials which serve as phase stabilizers and/or co-solvents. Example are C<sub>1</sub>-C<sub>3</sub> alcohols or diols such as methanol, ethanol, propanol and 1,2-propanediol. C<sub>1</sub>-C<sub>3</sub>  
30 alkanolamines such as mono-, di- and triethanolamines and monoisopropanolamine can also be used, by themselves or in combination with the alcohols.

- 56 -

If the composition is in liquid form, it may be anhydrous, or, for example, contain up to 5 wt% water. Aqueous compositions generally contain greater than 8 wt%  
5 water based on the weight of the aqueous composition. Desirably the aqueous compositions contain more than 10 wt%, 15 wt%, 20 wt%, 25 wt% or 30 wt% water, but desirably less than 80 wt% water, more desirably less than 70 wt%, 60 wt%, 50 wt% or 40 wt% water. They may,  
10 for example, contain from 30 to 65 wt% water.

The compositions may optionally comprise components which adjust or maintain the pH of the compositions at optimum levels. Examples of pH adjusting agents are NaOH  
15 and citric acid. The pH may be from, for example, 1 to 13, such as 8 to 11 depending on the nature of the composition. For example, a dishwashing composition desirably has a pH of 8 to 11, a laundry composition desirably has a pH of 7 to 9, and a water-softening  
20 composition desirably has a pH of 7 to 9.

The composition, such as a washing composition within the container, capsule or receptacle part, or within a compartment thereof if there is more than one  
25 compartment, need not be uniform. For example during manufacture it could be fed first with a settable agent, for example a gel, useful in a washing process, and then with a different material. The first material could dissolve slowly in the washing process so as to deliver  
30 its charge over a long period within the washing process. This might be useful, for example, to provide delayed or

- 57 -

sustained delivery of a softening agent in a clothes washing capsule.

The composition, such as a washing composition may, especially for dishwashing or laundry, include a tablet. Preferably a tablet contains a material useful in a washing process and is formulated to provide slow release of that material during a washing process and/or delayed release thereof. Delayed release may be achieved by providing the tablet with a coating which is slow to dissolve during the washing process. Alternatively the tablet may provide a quick release of components required early in the wash, for example water-softening components and/or enzymes. The tablet may, for example, comprise a disrupting agent, such as one which effervesces when in contact with water such as a combination of citric acid and an alkali metal carbonate or bicarbonate.

A tablet may be provided in the main volume of the receptacle part or may be provided in an outwardly facing opening or depression, as previously described.

When a washing capsule of the invention has a tablet retained in an outwardly facing opening or depression the tablet is preferably one which will not transfer any washing composition to the hands of a user. For example, it may be coated with a soluble polymeric material. As mentioned above, this may also be desirable for delayed release of its charge. If it is desired that the tablet dissolves quickly it may, for example, comprise a disrupting agent such as an effervescing agent.

- 58 -

In accordance with a further aspect of the invention there is provided a method of ware washing, comprising use of a container, receptacle or washing capsule as described and defined above, the method entailing

5 introducing the container, receptacle or washing capsule into a ware washing machine such as a laundry washing machine or dishwashing machine, prior to commencement of the washing process, the container, receptacle or washing capsule being entirely consumed during the washing

10 process.

The invention also provides a capsule - that is to say, a container for the relevant ingredients, which container is in at least two parts (a body part and a cap

15 part) which fit tightly, and preferably sealingly and inseparably, together to form a compartment in which is stored the ingredient to be delivered. In one example - see Figure 11A in the accompanying Drawings - the capsule may have a body and cap each provided with a central

20 axially-parallel partition, so that the capsule as a whole has two separate compartments. In another example the capsule may have three parts - a body, a first cap, and then a second cap to fit over the closed end of either the body or the first cap, so as again to result

25 in a capsule with two separate compartments. And where there are two or three such parts (or more; four parts - a body and three caps - make three compartments, and so on), then naturally the ingredients in each compartment may be the same or they may be different.

30

The capsule of the invention is one that dissolves in the destined aqueous medium to release its contents

- 59 -

therein. The term "dissolve" is used herein in a fairly general sense, to indicate that the capsule crumbles, decomposes, disintegrates or disperses; it need not actually dissolve, although in most cases it will.

5

The invention will now be further described, by way of example, with reference to the accompanying drawings in which.

10 Fig. 1 is a perspective view, generally from above, of an array of receptacle parts;

Fig. 2 is a perspective view, generally from above, of an alternative array of receptacle parts;

15

Fig. 3 is a perspective view of some of the parts shown in Fig. 2, but looking generally from underneath;

Fig. 4 is a perspective view, generally from above,  
20 of a third embodiment of receptacle part;

Fig. 5 is a perspective view, generally from above, of the Fig. 4 embodiment, but filled with washing composition and closed over by a closure part, to form a  
25 washing capsule of the invention;

Fig. 6 is a perspective view from above of a fourth embodiment of receptacle part; and

30 Fig. 7 is a perspective view from below of receptacle parts of the type shown in Fig. 6.

- 60 -

Fig. 8A & B show longitudinal cross-sections of a capsular container of the invention in its open and closed states respectively;

5 Fig. 9 shows the closed capsular container of Fig. 8B but in see-through perspective;

Fig. 10A & B show longitudinal cross-sections of two- and three-compartment capsular containers of the  
10 invention;

Fig. 11A & B show respectively longitudinal and transverse cross-sections of another two-compartment capsular container of the invention;

15 Fig. 12 shows a section through the wall of a solid-filled polymer capsule of the invention;

Fig. 13A-M show various different forms of moulding  
20 on and in the surface of capsular containers of the invention.

Fig. 1 shows an array of eight receptacle parts 2, arranged as two columns and four rows. Each receptacle  
25 part has a flat base wall without indentations or recesses and four uprights side walls 4, and has no top wall. Thus, each receptacle part is upwardly open. Around its opening, at the top of the side walls 4, is an outwardly-directed flange 6, which extends around the  
30 entire opening. The receptacle parts are joined to adjacent receptacle parts by webs 8 between the flanges 6. The flanges 6 of all of the receptacle parts lie in

- 61 -

one plane. The base walls of all of the receptacle parts also lie in one place, parallel to the plane in which the flanges lie.

5       The array shown in the drawing is made by injection moulding. The thermoplastic polymer employed in this embodiment is polyvinyl alcohol, and is translucent. The wall thickness is about 0.7 mm. The resulting moulded array is self-supporting.

10

After injection moulding score lines may be cut into the webs 8 between the flanges, to aid the breaking apart of the washing capsules, for use.

15       The moulded array is fed to a filling zone where the receptacle parts are simultaneously filled via eight nozzles, with a dishwashing composition. The dishwashing composition could be a powder, gel or paste or could be a liquid formulation. If it is a liquid it may be a liquid  
20       formulation of relatively low water content, for example, 2 to 5 wt%, given the properties of the polymer. Alternatively the water content may be higher, for example up to 60 wt% or even 80 wt%, so long as the PVOH is not attacked by the composition. Such steps are  
25       described above. A translucent cover film is then laid over the array and heat sealed against the flanges 6, so that each receptacle part has, over it, a closure part. The closure part is also of polyvinyl alcohol, but is much thinner, about 80  $\mu$ m in this embodiment.

30

Although the film which constitutes the closure parts is tough it will be appreciated that it is

- 62 -

generally less robust than the receptacle parts. In this case, before packaging the product, the capsules may be put into face-to-face contact. An array of washing capsules identical to that of the drawing may be placed  
5 in face-to-face contact with it. Alternatively, and conveniently, the array shown in the drawing may be folded about line A-A shown in Fig. 1.

The drawing illustrates the invention but in  
10 practice an array of receptacle parts is likely to be considerably larger. Nevertheless, the manufacturing method would be as described.

In use, a user will simply break off a washing  
15 capsule from the array, and put it in the dishwashing machine. During the washing process the entire washing capsule will dissolve. The first part to dissolve will generally be the closure part. This may happen very quickly once the washing process starts and the washing  
20 composition will immediately be delivered. The receptacle part will generally dissolve more slowly but it will have dissolved entirely by the end of the washing process.

25 Figs. 2 and 3 show an alternative embodiment of the receptacle parts. The receptacle parts shown in Figs. 2 and 3 are of similar shape and size to those shown in Fig. 1, but have, within the main chamber defined by the base wall and side walls of each receptacle part, a  
30 generally cylindrical upstand 10, in a central position. Each upstand is open at its upper end, and its upper end is in the same plane as the flange 6.

- 63 -

As shown in Fig. 3, each receptacle part also has a depression 12 at a central position in its base wall. The depression is relatively shallow, and it is aligned with the upstand 10 carried by the base wall on its other side. Each depression contains within it a tablet 14. Each tablet contains a washing composition or a material which forms part of a washing composition, but is formulated for quick release, slow release and/or delayed release. For slow release it may be a tablet which dissolves over an extended period. For delayed release it may be a table coated with a polymeric coating which is slow to dissolve, so that it releases its charge in the middle or towards the end of a washing cycle.

15

Another difference between the embodiment of Fig. 2 and that of Fig. 1 is that in the Fig. 2 embodiment there is a plurality of breakable webs 16 of polymeric material extending between the flanges of adjacent receptacle parts.

20

The array shown in Figs. 2 and 3 is again made by injection moulding, using HPMC polymer having a wall thickness of about 0.8 mm, although PVOH, for example, may also be used. Tablets 14 are press-fitted into the depressions 12 in the undersides of the base walls. The array is then inverted for filling. The upstands 10 are filled with one material, and the remaining volumes, between the upstands and the side walls of the respective receptacle parts, are filled with another material. A cover film is then laid over the array and heat sealed against the flanges 6 and against the ends of the

30

- 64 -

upstands 10, so that each receptacle part has, over it, a closure part. The closure part is of HPMC, about 70 microns thick. Again, PVOH may, for example, also be used.

5

The embodiment shown in Figs. 4 and 5 is similar to that of Figs. 2 and 3 in having an upstand. However the remaining volume of the receptacle part is divided into two by means of walls 18, 20, extending from the upstand in opposed directions, and with each connecting with a  
10 respective side wall of the receptacle part. It will be apparent that the receptacle part comprises three main chambers whose contents are released into the washing water once the closure part dissolves. One chamber 22 is  
15 defined within the upstand and the other chambers 24, 26 are of identical size to each other and are defined between the upstand and the side walls. The underside of the receptacle part may, like the embodiment of Figs. 2 and 3, comprise a central depression into which is  
20 pressed a tablet. The receptacle parts are formed, in an array, by injection moulding.

Fig. 5 shows a washing capsule which uses the receptacle part shown in Fig. 4. The receptacle part has  
25 been filled with three different materials useful in a dishwashing cycle and a cover film is shown in place.

The embodiment of Figs. 6 and 7 is simpler than those of Figs. 2 to 5. The receptacle part shown does  
30 not have a central upstand. There is one main volume. However the underside of the base wall is moulded with a depression and into this depression is press-fitted a

- 65 -

tablet. In the embodiment of Figs. 6 and 7 the main chamber of the receptacle part can be filled with two or more gels which stay separate, for example, side by side, or one within the other, or in the form of separate  
5 stripes. The receptacle parts of Figs. 6 and 7 may be formed, in an array, by vacuum forming.

In the embodiments of Figs. 4 to 7 the materials selected for the receptacle parts and closure parts, and  
10 their thicknesses, are as described for the Fig. 1 embodiment.

Figure 8 shows a two-part, one compartment capsular container of the invention in its open and its closed  
15 form.

The body (111) and cap (112) are to be welded together and are made so that the open end (111a) of one will pass into the open end (112a) of the other with the  
20 smallest gap that can be practically achieved to allow easy assembly. There is a "stop" - a ridge (111b) running all round outside of the body 111 that co-operates with a groove (112b) running all round the inside of the cap 112 - so that the entry of one into the  
25 other cannot overrun, and stops at the same fixed position in every case.

When the two halves or shells 111, 112 are in the closed position (as in Figure 8B), with the entire  
30 periphery of the open end 111a of the body 111 overlapped by the periphery of the open end 112a of the cap 112, the capsular container is ready for welding. The welding

- 66 -

equipment (not shown) forms a weld line (113) between the two layers all round the periphery of the container.

Figures 10 and 11 show different sorts of multi-compartment capsular container according to the invention.

In Figure 10 the container is made in two or more parts (three in Figure 10A, four are shown in Figure 10B, but there could be more) - in each case there is a single cap portion (132) and a plurality of body portions (as 131). The outer of the body portions 131 is much the same as an "ordinary" body portion (as in Figure 8), but each inner one is shaped at its "outer" end (131c) so that it will fit tightly inside the open mouth of the next body portion, much like in Figure 8 the body 111 fits inside the cap 112.

As shown (in Figure 10A), when the first (outer) body part 131 has been filled with product A, it may then be closed by the second (inner) body part 131 within it. That second body part 131 may then be filled with product B, the cap 132 placed in position, and the three parts welded together at the same time.

25

Figure 11 shows a capsular container with body (141) and cap (142) two compartments side-by-side (Figure 11B shows a transverse section on the line A-A in Figure 11A). The two compartments can of course hold different products (A and B).

30

- 67 -

There is theoretically no limit to the number of separate chambers that can be produced either linearly (as in Figure 10) or side by side within the body portion (as in Figure 11). Of course, limitations will be set by practical problems of manufacture.

In Figure 12 there is shown a section through the wall of a solid-filled polymer capsular container of the invention.

10

Inert solids in powder form have been added to the polymer formulation prior to moulding. This provides a more rigid shell. It especially provides a more rigid capsule shell with a surface less immediately affected by the aqueous content of the mouth or oesophagus, thereby reducing surface tackiness during the initial swallowing. The capsule surface is to a significant extent made up of the particulate insoluble solid ingredient (as 154); the soluble polymer (155) is partially concealed below the contact surface (156).

20

Figure 13 etc show various different forms of moulding on the surface of capsular containers of the invention, some in the form of cross-sections.

25

These are self-evident, and need little comment. Figure 13A, F, for example, shows a capsular container with longitudinal raised ribs, while Figure 13B shows one with lateral (or circumferential) raised ribs and Figure 13E shows one with helical ribs. Figure 13C, H shows a container with raised pimples, while Figure 13D, I shows one with raised identification coding patterns. Figures

30

- 68 -

13G, J, K, L and M show variants analogues to some of the others, but with incuse rather than raised portions.

The invention is further explained in the following  
5 Examples.

### EXAMPLES

Example 1:

10 The manufacture of capsules by injection moulding and  
laser welding

#### The moulding stage

15 Capsules according to the invention were made by the injection moulding method utilising an Arborg 220D (35 tonne) injection moulding machine. The injection cavities were in a two-impression (cap/body) composite water-cooled stainless-steel mould. The PVOH had a  
20 material melt flow index of 10-20 grams per 10 mins (DIN 53735).

Injection temperatures were 175°C, 180°C, 180°C and 185°C in the feed, zone 2 and 3, and Nozzle areas. The  
25 first stage injection pressure was 400psi (.....), and the hold stage pressure was 270psi (.....). The pressure well time was 3 secs in the first stage and 5 secs in the hold stage. Tool temperatures were between ambient and 40°C.

30

The moulding pressures were just sufficient to fill the cavities on the first pressure stage and then

- 69 -

sufficient packing pressure to hold on the second stage. Mould open and close rates were as fast as possible.

As noted, the mould layout was divided into two halves, one half moulding capsule bases and the other half capsule caps. After the mould opening sequence, two robotically controlled loading plates pneumatically picked up each capsule half from each tool face. With identical cavity pitch centres, these loading plates were brought together so that each capsule half was located resulting in the usual temporary location of the pair ready for automatic filling.

#### The filling stage

For test purposes the capsules were filled by hand with various test materials (see below).

#### The welding stage

The closed capsule is introduced into a transparent tube with an internal diameter not more than 20% greater than the external diameter of the capsule. An array of diodes is located circumferentially around the outside of the tube. As the capsule passes by the diode array, a weld is formed. The velocity of the capsule and the power of the IR emitted by the diode array provide the necessary control over the melting process. The IR emission is either continuous or discontinuous. In the case of discontinuous emission, this is achieved by synchronisation of switching depending on the form of

- 70 -

weld required and the sensitivity of the contents of the capsule to the IR.

If the characteristics of the material contained  
5 within the capsule are such that they absorb the IR,  
switching of the laser is necessary such that exposure to  
the IR is limited to the area of the join. This is  
effected by means of electrical switching or, in a  
further embodiment, by a form of optical switching using  
10 a lens/prism arrangement. In order to overcome the  
difficulty of synchronisation, again optical fibre  
delivery of the IR is used to restrict the area of  
exposure.

15 Example 2:

The manufacture of capsules using laser welding

In an alternative laser welding stage, the laser or  
other IR source is arranged to focus on the area of the  
20 join. This does not create a full circumferential weld  
but generates a spot weld. Again, the laser is  
continuously emitting. By forcing the filled capsules to  
roll (by mechanical means) whilst exposed to the laser, a  
full circumferential weld results. Alternatively, an  
25 optical fibre is used to deliver the IR to the join.

Test Results

PVOH capsules made in the manner described in  
30 Example 1 above were filled with either sugar or  
tea leaves. They were designed to have a cap portion

- 71 -

that would dissolve sooner than the body, and thus open the capsule progressively.

Similarly, a number of conventional gelatine  
5 capsules were also prepared and so filled.


In the Test, a capsule was placed in each Test Subject's mouth (in the buccal cavity), and the Subject was asked to note when he/she became aware of the taste  
10 of the contents - thus, when the capsule "opened" - and then when the capsule had completely dissolved.

There were two Test Subjects, and each Test was carried out twelve times (for each filling).

15

The conventional gelatine capsules opened in 3-4 minutes, and dissolved completely in 5-8 minutes. The sugar-filled PVOH capsules of the invention opened in 8-12 minutes, while the tea-filled ones took longer -  
20 14-18 minutes. Complete dissolution took 30-40 minutes in each case.

## CLAIMS

- 
1. A rigid, water-soluble container made of an  
5 injection moulded poly(vinyl alcohol) and/or a cellulose  
ether, which container encases a fabric care, surface  
care or dishwashing composition.
2. A container according to claim 1 which encases a  
10 dishwashing, water-softening, laundry, detergent, rinse  
aid, disinfectant, antibacterial or antiseptic  
composition or a refill composition for a trigger-type  
spray.
- 15 3. A container according to claim 1 or 2 which has two  
or more compartments.
4. A container according to any one of the preceding  
claims wherein the composition has a mass of at least  
20 15g.
5. A container according to claim 4 wherein the  
composition has a mass of from 15 to 40g.
- 25 6. A container according to any one of the preceding  
claims which comprises a poly(vinyl alcohol).
7. A container according to any one of the preceding  
claims which comprises hydroxypropylmethylcellulose.
- 30 8. A container according to any one of the preceding  
claims wherein the container is sealed by a water-soluble

- 73 -

closure part in the form of a film or injection-moulded, rigid closure.

9. A container according to claim 8 wherein the closure  
5 part comprises a poly(vinyl alcohol) film or closure.

10. A container according to any one of the preceding claims which contains a dishwashing, water-softening, laundry or detergent composition or a rinse aid.

10

11. A container according to any one of claims 1 to 9 which contains a disinfectant, antibacterial or antiseptic composition.

15 12. A container according to any one of claim 1 to 9 which contains a refill composition for a trigger-type spray.

13. A capsule comprising a self-supporting receptacle  
20 part and a closure part, the receptacle part and the closure part together enclosing a fabric care, surface care or dishwashing composition, the receptacle part being formed of a water-soluble polymer, and the closure part being formed of a water-soluble polymer, wherein, in  
25 use, the closure part dissolves before the receptacle part.

14. A capsule according to claim 13 wherein the water-soluble polymer is a poly(vinyl alcohol) or a cellulose  
30 ether.

- 74 -

15. A capsule comprising a self-supporting receptacle part and a closure part, the receptacle part and the closure part together enclosing a fabric care, surface care or dishwashing composition, the receptacle part  
5 being formed of a water-soluble polymer, and the closure part being formed of a water-soluble polymer, wherein the water-soluble polymer is a poly(vinyl alcohol) or a cellulose ether.
- 10 16. A capsule according to claim 15 wherein, in use, the closure part dissolves before the receptacle part.
17. A capsule according to any one of claim 13 to 16 which is a washing capsule enclosing a washing  
15 composition.
18. A capsule according to any one of claims 13 to 17 wherein the receptacle part has side walls which terminate at their upper end in an outward flange, to  
20 which the closure part is sealingly secured.
19. A capsule according to any one of claims 13 to 18 wherein the closure part is a plastics film.
- 25 20. A capsule according to any one of claims 13 to 19 wherein the composition comprises a powder, gel, paste or low water liquid formulation.
21. A washing capsule according to any one of claims 13  
30 to 20 wherein the washing capsule comprises a tablet formulated for delayed and/or sustained release of a material.

- 75 -

22. A capsule according to any one of claims 13 to 21 wherein the receptacle part defines two or more compartments which contain different products.

5

23. A capsule according to claim 22 wherein the receptacle part comprises an upstanding wall which separates compartments thereof.

10 24. A capsule according to any one of claims 13 to 23 wherein the receptacle part comprises an outwardly facing opening into which a tablet, preferably comprising a material useful in a washing process, is press-fitted.

15 25. A capsule according to any one of claims 13 to 24 where the washing composition contains an enzyme.

20 26. A capsule according to any one of claims 13 to 25 wherein the closure part is a transparent or translucent material.

27. A washing capsule according to any one of claims 13 to 26 wherein the water-soluble polymer is a poly(vinyl alcohol).

25

28. An array of washing capsules as defined in any one of claims 13 to 27 which are joined together but are readily separable from each other for use.

30 29. An array according to claim 28 wherein the array has a line of symmetry extending between capsules, and the two halves of the array are folded together about the

- 76 -

line of symmetry, with the closure parts in face-to-face contact.

30. A method of manufacturing an array of washing  
5 capsules as defined in claim 28 or 29, which method  
comprises: forming an array of receptacle parts, each  
receptacle part being connected to adjacent receptacle  
parts but being separable from them by a snap or tear  
action; charging the receptacle parts with washing  
10 composition; and sealingly securing a sheet of a water-  
soluble polymer over the top of the array, to form the  
closure parts for all the receptacle parts of the array.

31. An injection-moulded capsule container of any size  
15 or shape for the delivery of a water-destined ingredient  
selected from a fabric care, surface care or dishwashing  
composition, which container is made of a material that  
will dissolve in the intended aqueous destination site.

20 32. A container according to claim 31 wherein the  
composition is a detergent, biocide, deodorant or water-  
treatment chemical.

33. A container according to claim 31 or 32 wherein the  
25 material that will dissolve is a poly(vinyl alcohol) or a  
cellulose ether.

34. A container according to any one of claims 31 to 33  
which is in the form of an elongate tubular package with  
30 closed, rounded ends.

- 77 -

35. A method of ware washing, comprising use of a container, receptacle or washing capsule as defined in any one of the preceding claims, the method entailing introducing the container, receptacle or washing capsule  
5 into a ware washing machine prior to commencement of the washing process, the container or washing capsule being entirely consumed during the washing process.

36. A capsule container comprising at least two  
10 components made of one or more material(s) that can be moulded and which are water soluble or water dispersible or in which a substantial part of the surface of these components is water soluble or water dispersible so as to leave perforations throughout the wall when the capsular  
15 container is placed in contact with an aqueous environment, wherein the container has one to six compartments, preferably one or two or three, the content of the various compartments being accessible to the aqueous environment when the capsular container is  
20 exposed to such an aqueous environment, the accessibility time of the various compartments being the same or different from one compartment to another compartment, with the proviso that the content of the container is not a fabric care, surface care or dishwashing composition.

25

37. Container according to claim 36 wherein the moulded compartments are made from injection moulding material.

38. Container according to claim 36 wherein the moulded  
30 components are wholly water soluble or water dispersible.

- 78 -

39. Container according to any of claims 36 to 38 wherein the material(s) are soluble in an aqueous environment at 5°C or higher.

5 40. Container according to any of claims 36 to 39 wherein the material(s) are soluble in an aqueous environment between 35°C and 37°C.

41. Container according to any of claims 36 to 40 with  
10 at least two compartments, preferably two or three.

42. Container according to any of claims 36 to 41 wherein the accessibility time of the various compartments to the aqueous environment is different from  
15 one compartment to another compartment.

43. Container according to any of claims 36 to 42 wherein the components are one body and one or more caps, preferably one or two caps.

20

44. Container according to any of claims 36 to 43 wherein the difference of accessibility time to an aqueous environment from one compartment to another one is in the range of 1 minute to 12 hours at the same  
25 temperature in the range of 5°C to 95°C.

45. Container according to any of claims 36 to 44 wherein the container is made from one or more materials which are water-soluble polymers.

30

46. Container according to claim 45 where the materials is polyvinyl alcohol or cellulose derivatives.

- 79 -

47. Container according to claim 46 where the material is polyvinyl alcohol.

5 48. Container according to any of claims 36 to 47 wherein the container contains at least one active ingredient in each compartment, and where if more than one compartment, the ingredients are different.

10 49. Container according to any of claims 36 to 48 wherein the closing of the capsular container by putting the cap on the body has the effect of separating the compartments from each other.

15 50. Container according to any of claims 36 to 49 wherein the closing of a compartment by putting a cap on a body allows that compartment to be separated from the next one.

20 51. Container according to any of claims 36 to 50 wherein the components are welded to form a single indivisible unit.

25 52. Container according to claim 51 wherein the welding is on a line around the container where preferably the line is situated on a planar cross-section of the container.

30 53. Container according to claim 51 or 52 wherein the welding is effected by laser welding.

54. Container according to claim 53 wherein either

- 80 -

(a) one of the surfaces before welding is coated with a laser beam reflecting ingredient, or

(b) one of the components is moulded with a laser beam reflecting ingredient contained within it.

5

55. Container according to any of claims 36 to 54 wherein the accessibility time of the various compartments is due to the difference in thickness of the wall of the compartment.

10

56. Container according to claims 36 to 55 wherein the thinner area(s) are made of a water soluble or water dispersible coating covering perforation(s) in the wall of any component.

15

57. Container according to any of claims 36 to 54 wherein the accessibility time of the various compartments is due to differences in the nature of the polymers used to make different compartments.

20

58. Container according to any of claims 36 to 57 wherein a component has a conical shape.

59. Container according to claim 55 wherein the thinner areas of the walls are disposed longitudinally according to the general elongated shape of the capsular container.

60. A capsular container according to any of claims 36 to 59 having raised portions on its external surface and wherein the raised portions are in the form of short, small pimple like projections or ribs that extend wholly or partially either around or along the capsule, and/or

- 81 -

of markings allowing identification of the capsular contained and/or its contents.

61. A capsular container according to any of claims 36  
5 to 60 having raised portions on its external surface and wherein the raised portions provide an incuse pattern design on a capsular container of standard form but with relatively thick walls, so forming an array of thin-walled panels such that in use the thin-walled panels  
10 quickly dissolve, leaving the capsule with a grid structure of holes.

62. Container according to any of claims 36 to 61 wherein the wall of the container contains particles  
15 which are susceptible to accelerate the rate of dissolution of the capsular container.

63. Container according to claims 62 wherein the particles are made of a material susceptible to react  
20 chemically with the environment in which the capsular container is to be used, the reaction causing preferably an effervescence.

64. Container according to claim 62 or 63 where the  
25 particle size of is 1 to 100 microns, preferably from 2 to 80 microns.

65. Container according to any of claims 62 to 64 wherein the material of the particle is selected in the  
30 group comprising sodium or potassium or magnesium carbonate or bicarbonate; tartaric acid, citric acid, cinnamic acid; or the salts thereof.

66. A capsular container according to any of Claims 36 to 65 for a pharmaceutical or nutraceutical use or when used for a pharmaceutical or nutraceutical purpose.

5

67. Container according to claim 66 for delivery of one or more pharmaceutically or nutraceutically active ingredients into a human or animal body.

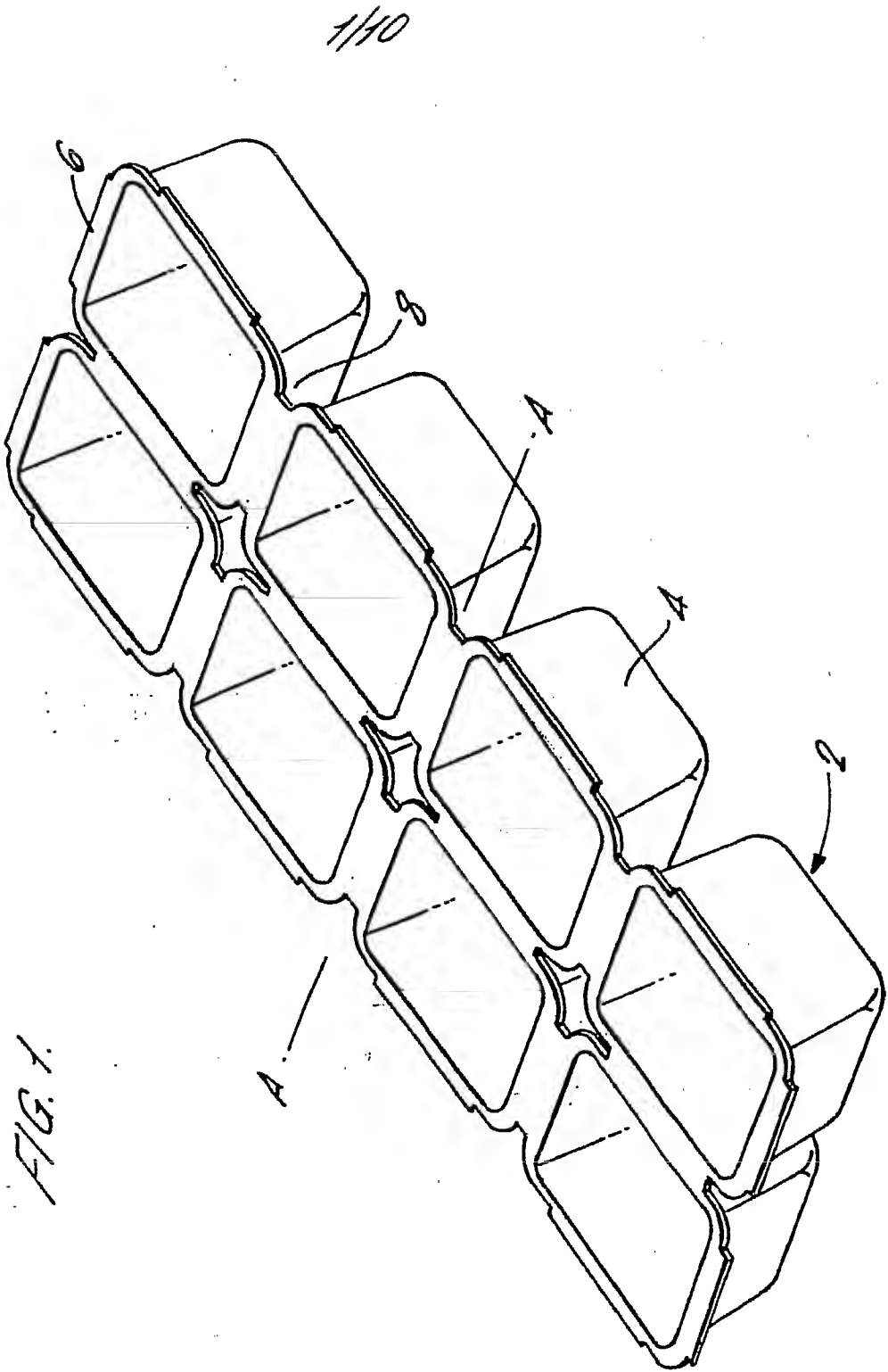
10

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20

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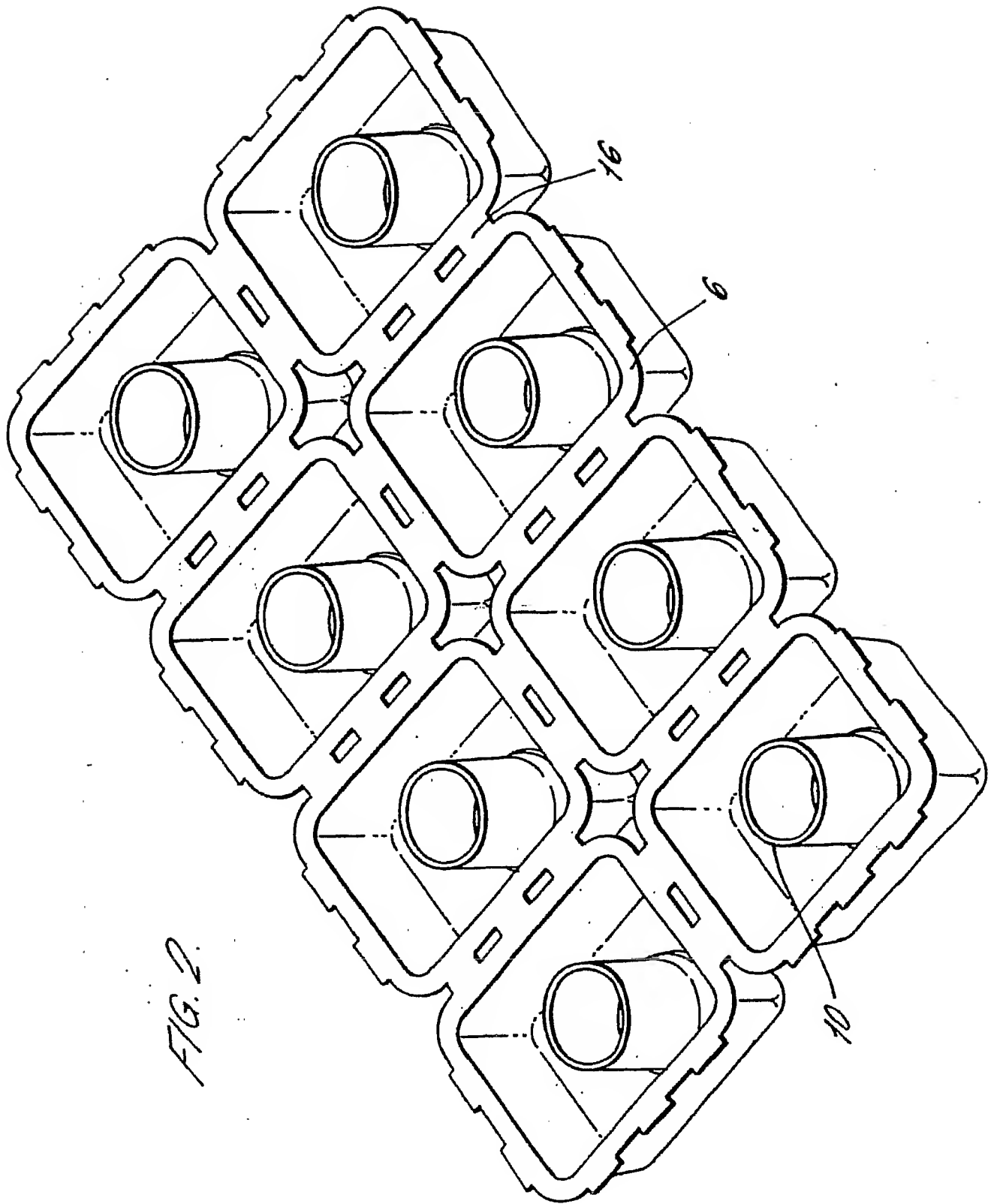
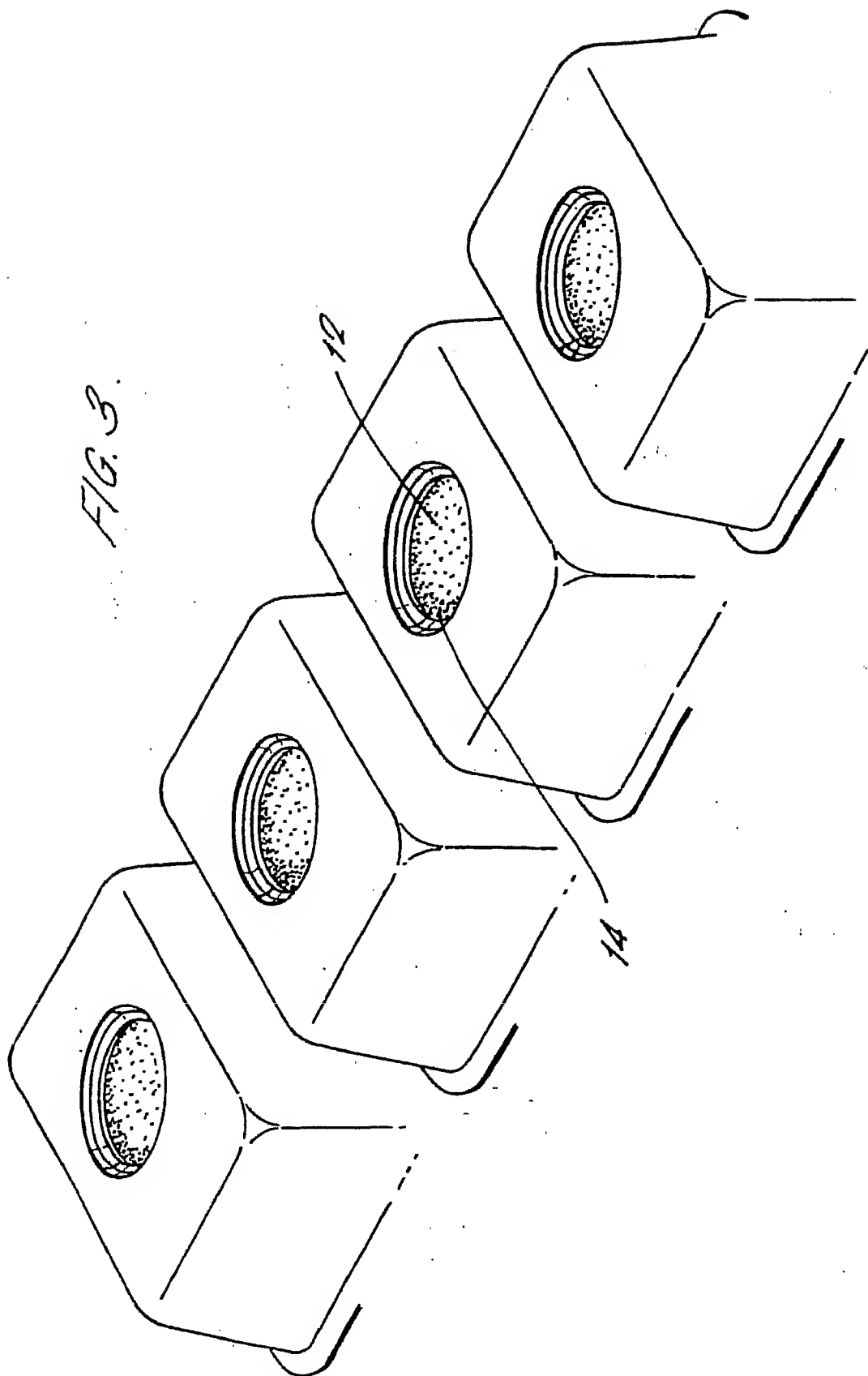


FIG. 2

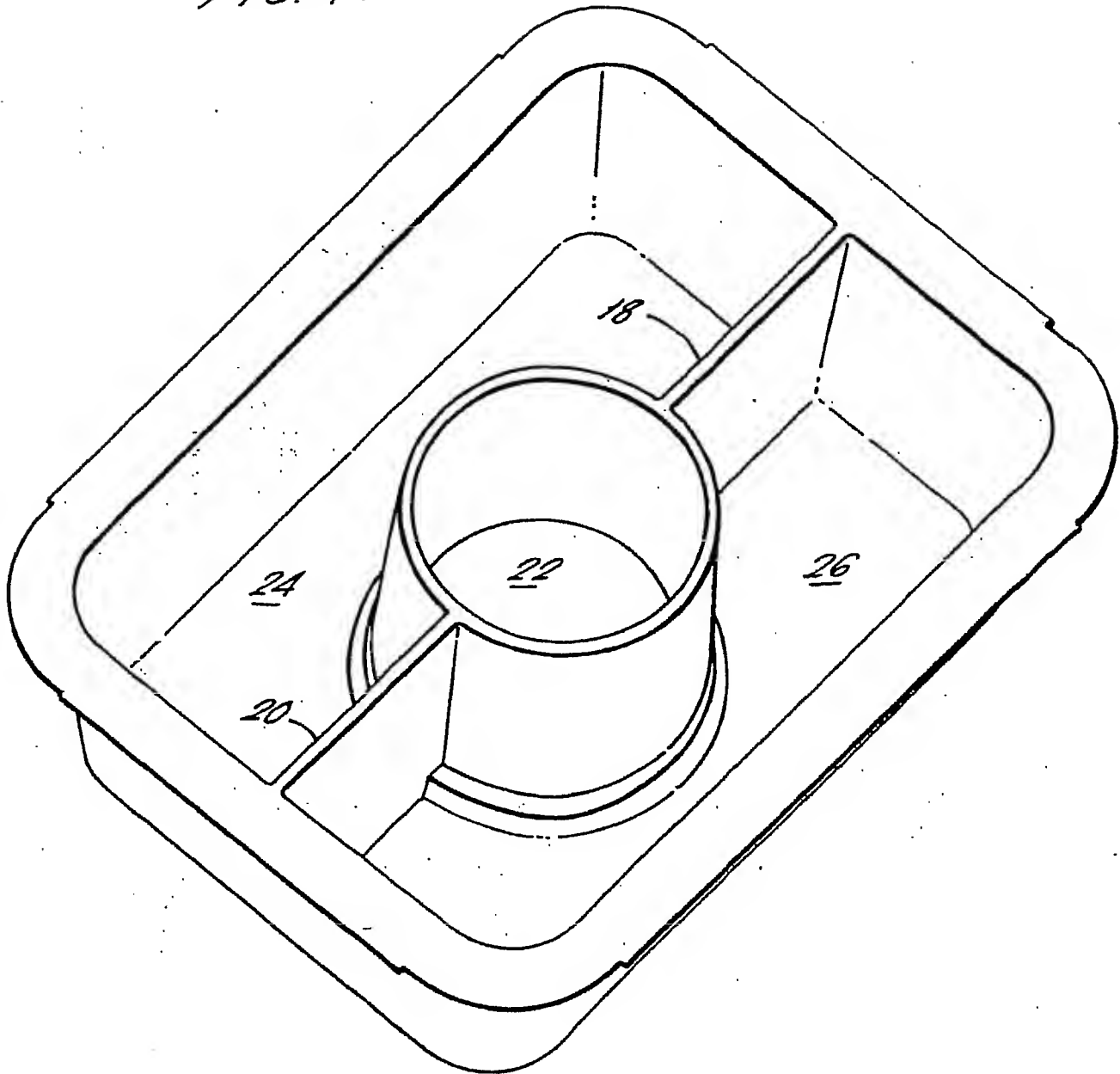
3/10

FIG. 3.



4/10

FIG. 4.



5/10

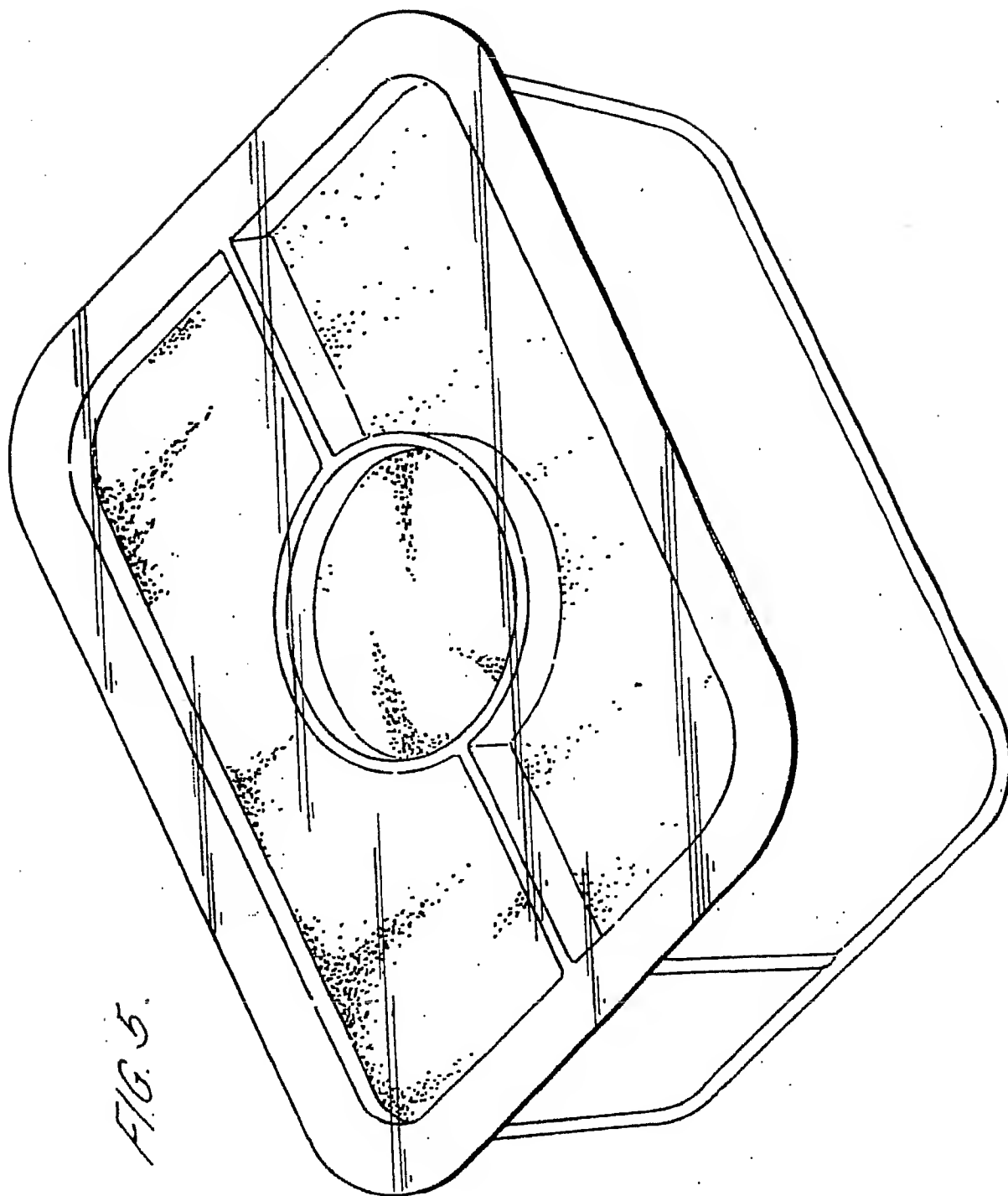


FIG. 5.

6/10

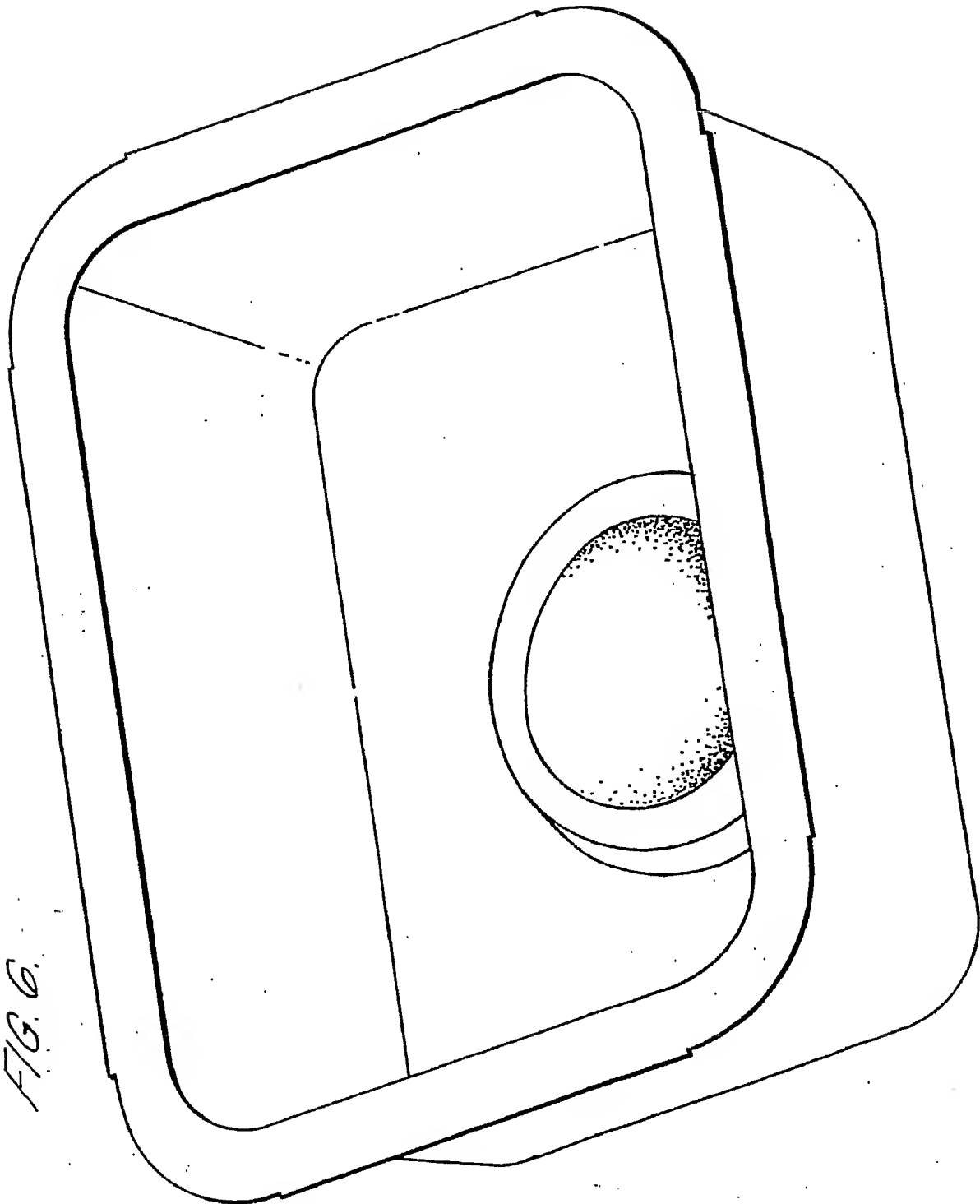
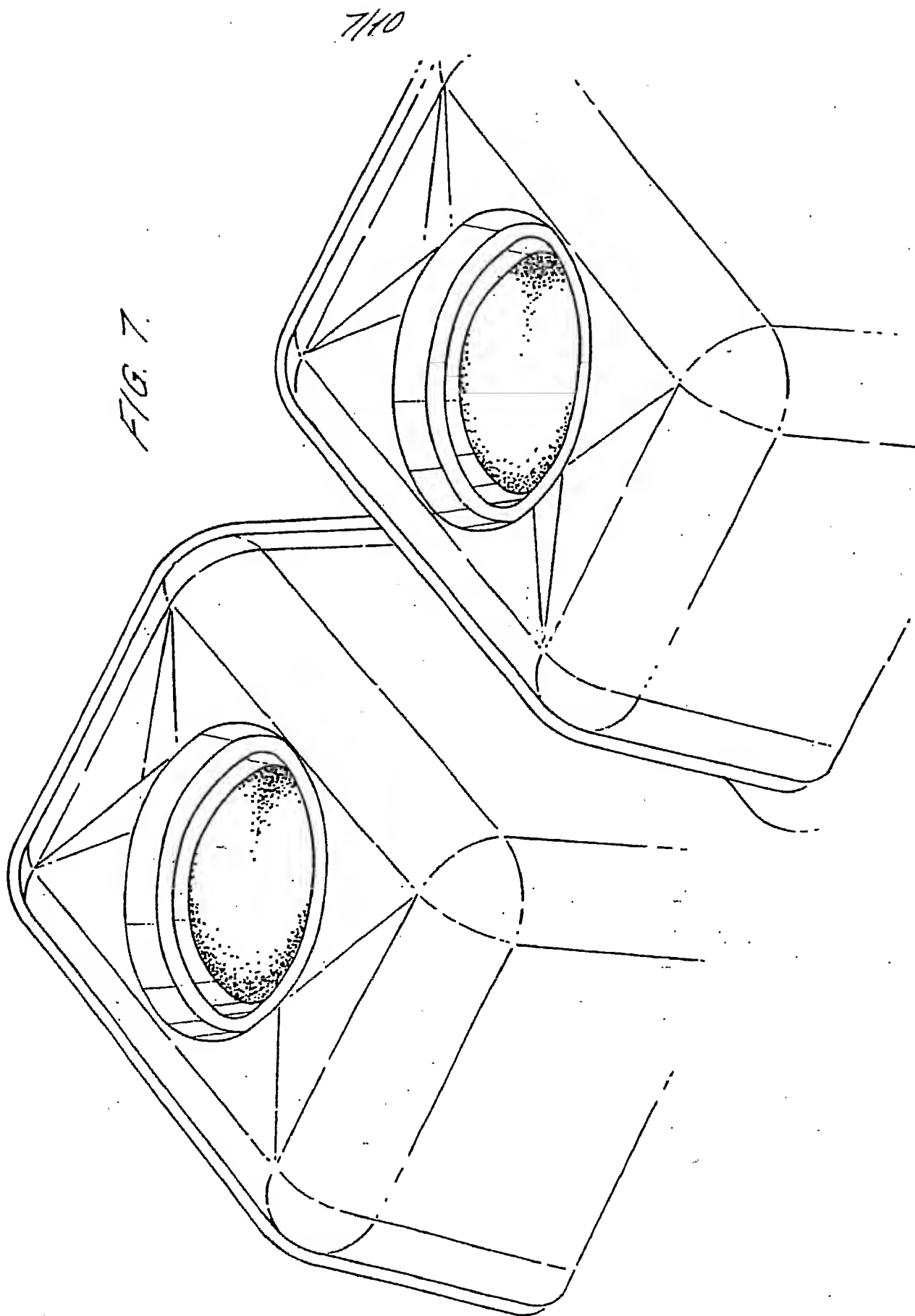


FIG. 6.



8/10

FIG. 8A.

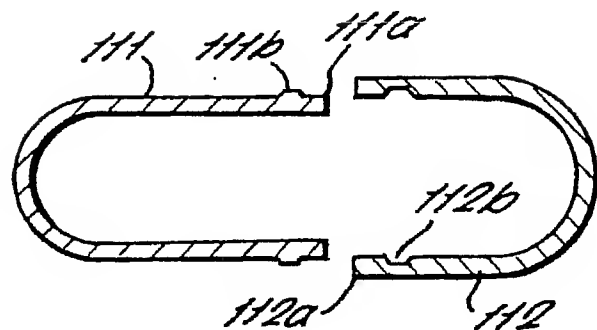


FIG. 8B.

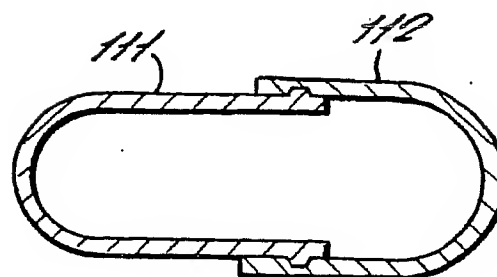


FIG. 9.

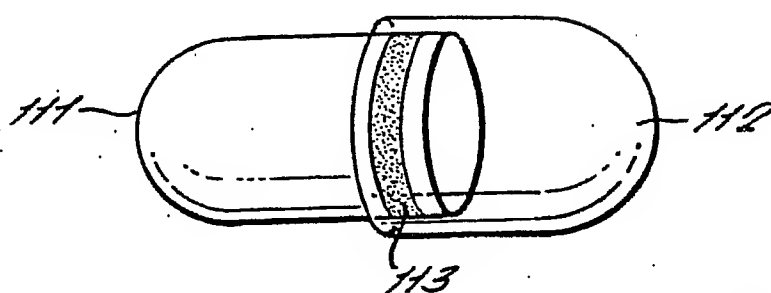


FIG. 10A.

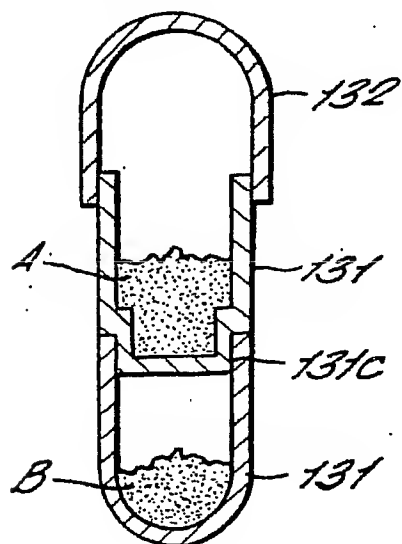
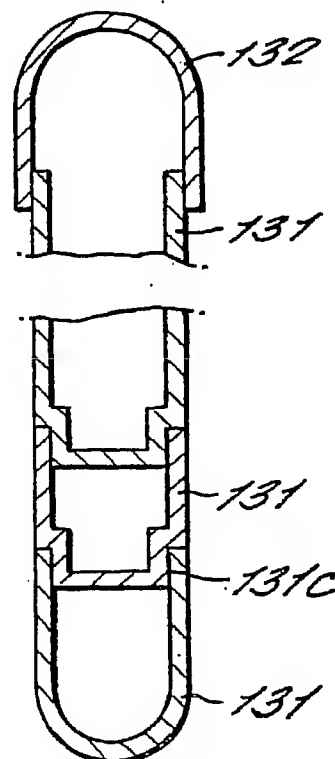


FIG. 10B.



9/10

FIG. 11A.

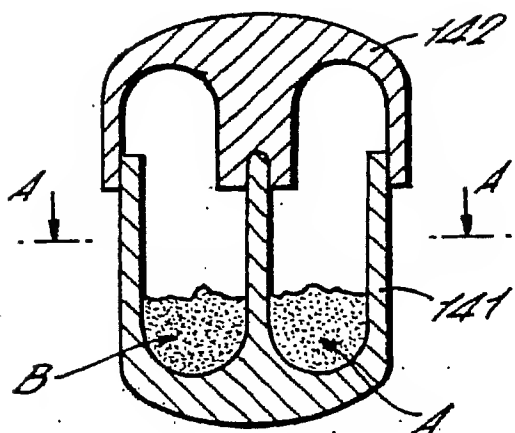


FIG. 11B.

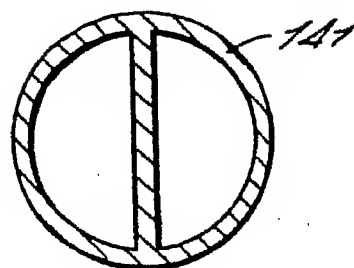
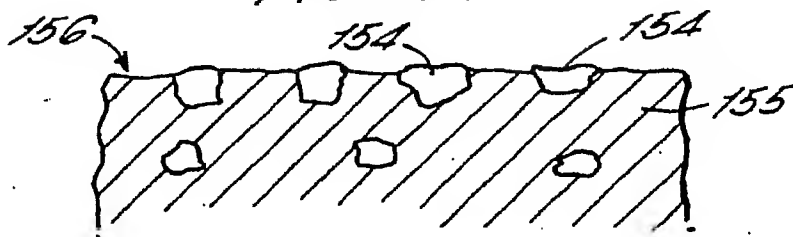


FIG. 12.



10/40

FIG. 13A. FIG. 13B. FIG. 13C. FIG. 13D. FIG. 13E.

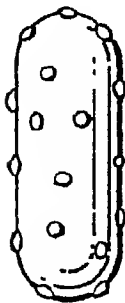
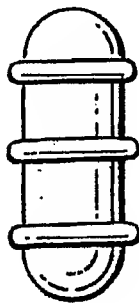
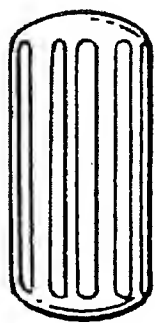


FIG. 13F. FIG. 13G. FIG. 13H. FIG. 13I. FIG. 13J.

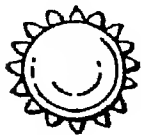


FIG. 13K.



FIG. 13L. FIG. 13M.



A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B65D65/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

20 February 2001

Date of mailing of the international search report

27/02/2001

Name and mailing address of the ISA

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Vollering, J

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(11) N° de publication :  
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(51) Int Cl<sup>4</sup> : B 65 D 47/08, 55/12.

(12)

## DEMANDE DE BREVET D'INVENTION

A1

(22) Date de dépôt : 7 novembre 1986.

(30) Priorité : DE. 14 décembre 1985, n° G 85 35 205.5; 20 septembre 1986, n° P 36 32 057.9.

(43) Date de la mise à disposition du public de la demande : BOPI « Brevets » n° 25 du 19 juin 1987.

(60) Références à d'autres documents nationaux apparentés :

(71) Demandeur(s) : Société dite : VEDDER + COMP. GmbH. — DE.

(72) Inventeur(s) : Josef Vedder.

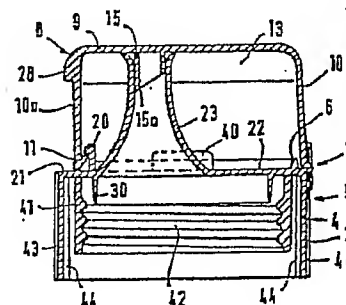
(73) Titulaire(s) :

(74) Mandataire(s) : Cabinet Peuscet.

(54) Obturateur.

(57) Cet obturateur pour un récipient du type bouteille ou boîte, comporte un chapeau 8 qui est constitué d'une paroi latérale 10 et d'une paroi supérieure 9, qui est fixé à une pièce d'embouchure 4 au moyen d'une articulation à charnière 7 et avec possibilité de rabattement, et sur lequel, en face de l'articulation à charnière 7, sur la face supérieure de la pièce d'embouchure 4, est prévue une saillie de crantage de verrou 20, qui est dirigée vers le haut et vers l'extérieur et qui vient en prise, de façon amovible, avec un contre-organe 11; dirigé vers l'intérieur, de la paroi latérale 10 du chapeau 8. La paroi latérale 10 du chapeau 8 est élastiquement déformable et peut se déformer lorsque l'on appuie radialement, en direction du verrou, sur deux portions 10b, situées en face l'une de l'autre. Il est essentiel pour l'invention que, sur la face supérieure de la pièce d'embouchure, au voisinage des deux portions de chapeau 10b, soit respectivement disposé un doigt 40 qui se dresse verticalement pour limiter la profondeur à laquelle on peut pousser les portions du chapeau 10b.

Un tel obturateur présente une sécurité fiable à l'égard des enfants.



OBTURATEUR

L'invention se rapporte à un obturateur pour un récipient du type bouteille ou boîte, comportant un chapeau, qui est constitué d'une paroi latérale et d'une paroi supérieure, qui est fixé, avec possibilité de rabattement, à une pièce d'embouchure au moyen d'une articulation à charnière et sur lequel, en face de l'articulation à charnière, sur la face supérieure de la pièce d'embouchure, est prévue une saillie de crantage de verrou, qui est dirigée vers le haut et vers l'extérieur et qui vient en prise, de façon amovible, avec un contre-organe, dirigé vers l'intérieur, de la paroi latérale du chapeau, la paroi latérale du chapeau étant élastiquement déformable et pouvant se déformer lorsque l'on appuie radialement, en direction du verrou, sur deux portions situées en face l'une de l'autre.

On sait qu'une série de substances, que l'on emploie journellement dans l'entretien ménager, sont extrêmement dangereuses pour les enfants. Il s'agit en premier lieu des médicaments, des produits d'entretien, des insecticides et produits agressifs et dangereux pour la santé. On a procédé à de nombreux essais pour créer des obturateurs présentant une sécurité pour les enfants pour se protéger à l'égard de ces produits, généralement liquides. Des obturateurs connus de ce type sont constitués d'un couvercle vissé auquel est relié, de façon imperdable, un chapeau de sécurité à paroi latérale souple qui, à l'état non déformé, tourne fou par rapport au couvercle à visser, de sorte qu'il n'est pas possible de dévisser ce dernier. Ce n'est que, lorsque l'on connaît la relation d'action et que l'on appuie radialement sur la paroi latérale du chapeau de sécurité, que l'on peut entraîner le couvercle vissé en le fai-

- sant tourner et donc le visser ou le dévisser. Pour améliorer la transmission de la force entre le chapeau de sécurité déformé et le couvercle vissé on utilise par exemple des moletages de prise (DE-OS 22 54 688) et des saillies radiales (DE-OS 24 31 060). Il est apparu que de tels obturateurs vissés sont incommodes pour l'emploi journalier, car le vissage et le dévissage sont incommodes et parce que, aussi bien en cas de souillure humide et glissante de l'espace intermédiaire situé entre le couvercle vissé et le chapeau de sécurité qu'en cas de pénétration de particules solubles et de produits qui durcissent dans cet espace intermédiaire, la fonction de l'obturateur conforme à la prescription est mise en question. Dans le premier cas, du fait qu'il n'y a pas prise, par force, du chapeau de sécurité et du couvercle vissé, il y a le risque que le le couvercle vissé, invisible, ne soit pas vissé ou ne soit que partiellement vissé sur le récipient, de sorte que son contenu est librement accessible aux enfants. De plus l'ouverture volontaire de l'obturateur est pour le moins rendue plus difficile. Dans le second cas, le chapeau de sécurité et le couvercle vissé restent toujours réunis l'un à l'autre sans possibilité de rotation relative et la sécurité à l'égard des enfants est inopérante.
- 20 L'obturateur connu par ailleurs (DE-OS 24 35 337) du type mentionné au début ne présente certes pas les inconvénients signalés, toutefois il ne présente pas aussi une sécurité suffisante du fait que l'ouverture du chapeau peut être obtenue par des enfants, simplement en appuyant, d'après les essais effectués.
- 25 L'invention a pour objet d'équiper l'obturateur selon le document DE-OS 24 35 337 d'une sécurité plus fiable à l'égard des enfants.
- On atteint cet objet par le fait que sur la face supérieure de la pièce d'embouchure, au voisinage des deux portions de chapeau, est respectivement disposé un doigt, qui se dresse verticalement, pour limiter la
- 30 profondeur à laquelle on peut pousser les portions du chapeau.
- Un tel obturateur est plus sûr que les obturateurs connus du fait que le chapeau ne peut s'ouvrir que si, simultanément, on déforme les deux portions du chapeau et on pousse le chapeau vers le haut. Ce double effet de sécurité s'obtient par le fait que les deux doigts, qui sont sur la face
- 35 supérieure de la pièce d'embouchure, forment, pour les portions de la

paroi latérale du chapeau, des butées de poussée, qui limitent la déformation de la paroi latérale du chapeau en direction du verrou de façon telle que la prise, qui existe entre la saillie de crantage et le contre-organe, ne se supprime pas automatiquement, mais devient seulement plus lâche. Ce n'est que lorsque l'on pousse vers le haut le chapeau que le verrou se déverrouille complètement et que le chapeau s'ouvre en faisant ressort. Toute tentative d'extraire le chapeau sans presser simultanément et volontairement sur la paroi latérale et sans de plus pousser le chapeau vers le haut reste infructueuse pour l'ouverture de l'obturateur et la tentative d'ouverture ne réussit pas. L'astuce de cette double sécurité restera cachée aux enfants, car elle n'apparaît pas en faisant des essais. Ni le savon, ni d'autres produits collants ou glissants, ni des particules solides ne peuvent compromettre l'aptitude fonctionnelle de la sécurité à l'égard des enfants ou du chapeau rabattable, de sorte que l'obturateur convient particulièrement bien pour des récipients destinés à recevoir des produits d'entretien et autres produits éventuellement agressifs utilisés pour les besoins ménagers.

Dans une exécution avantageuse de l'invention, on prévoit que la paroi latérale du chapeau est convexe dans la zone des deux portions ; et que les doigts passent tout droit, comme sécantes de la forme convexe. Les doigts sont suffisamment hauts et longs pour former des butées fiables pour les portions du chapeau lorsque l'on décale celles-ci radialement vers l'intérieur en les poussant. Pour faciliter ce décalage, la face supérieure de la pièce d'embouchure ne présente pas de saillie dans cette zone de bordure et a une surface plane. Une nervure périphérique, dont la forme est adaptée par endroits à la forme de la paroi latérale, et qui se dresse depuis la face supérieure de la pièce d'embouchure, sert à interdire un coulisement latéral de l'ensemble du chapeau par rapport à la face supérieure de la pièce d'embouchure.

Il est intéressant que le chapeau et la pièce d'embouchure soient ronds, en particulier de forme circulaire, et il est prévu que la paroi latérale du chapeau est aplatie dans la zone du contre-organe et que l'organe de crantage est décalé vers l'intérieur de façon appropriée par rapport à la périphérie de la pièce d'embouchure. De cette façon il est pratiquement impossible de saisir par-dessous cette partie du chapeau avec

l'ongle d'un doigt ou avec un objet pointu pour ouvrir le chapeau sans déverrouiller réglementairement le verrou et sans simultanément pousser vers le haut le chapeau. En outre, du fait de cet aplatissement, la déformation, en voûte vers l'extérieur, de cette zone, lorsque l'on appuie sur la paroi latérale du chapeau, est limitée et la tenue du verrou est prolongée. La sécurité à l'égard des enfants fonctionne également avec une forme ovale ou polygonale de la pièce d'embouchure et du chapeau. Comme saillie de crantage et comme contre-organe on peut utiliser des parties en forme de profilés, dont la prise sur la pièce d'embouchure ne disparaît pas en cas de léger décalage latéral du chapeau.

Un verseur excentré se dresse verticalement depuis la face supérieure de la pièce d'embouchure et, sur la surface intérieure de la paroi supérieure du chapeau, est disposé un bouchon obturateur excentré, qui plonge dans l'ouverture du verseur. En plus de sa fonction d'étanchéité, le bouchon obturateur, qui plonge dans l'ouverture du verseur, a pour fonction de rendre plus difficile le fait de pousser le chapeau vers le haut. Ceci s'obtient par le fait que, lorsque le chapeau se rabat vers le haut, le bouchon obturateur se déplace selon un trajet courbe et que la longueur, dont il plonge, doit former un coude pour sortir hors de l'ouverture du verseur, avec déformation de la propre paroi du bouchon et de la paroi du verseur. Pour faciliter l'introduction du bouchon obturateur, il est avantageux que son bord libre soit chanfreiné et aille en décroissant en direction du côté du chapeau où se trouve l'articulation à charnière.

Il est prévu que la pièce d'embouchure et le chapeau sont fabriqués en une matière plastique et que l'articulation à charnière est une charnière à ruban autofermante. La charnière à ruban présente une languette médiane large et deux languettes latérales qui la flanquent, qui sont respectivement réunies au chapeau et à la pièce d'embouchure et dont la longueur est dimensionnée de façon que, lorsqu'on le fait pivoter, le chapeau soit poussé en position d'ouverture ou en position de fermeture avec dépassement du point mort.

La pièce d'embouchure peut venir de forme sur le col d'un récipient. Pour augmenter les possibilités d'utilisation de l'obturateur il est pourtant intéressant que la pièce d'embouchure ait la forme d'un corps à visser, avec sécurité antiretour, qui puisse se visser de façon

permanente sur un filetage extérieur du récipient.

Le dessin représente schématiquement un exemple d'exécution de l'invention :

La figure 1 est une vue perspective de l'obturateur fermé ;

5 La figure 2 est une vue perspective du processus d'ouverture de l'obturateur ;

La figure 3 est une vue perspective de l'obturateur ouvert ;

La figure 4 est une coupe verticale de l'obturateur fermé de la figure 1 ;

10 La figure 5 est une coupe verticale de l'obturateur ouvert ; et

La figure 6 est une vue de dessus du dispositif selon figure 5.

Un récipient en forme de bouteille 1 en plastique est muni, par l'intermédiaire d'une partie formant épaulement 2, d'un col qui comporte une ouverture et qui présente sur sa périphérie extérieure un  
15 filetage extérieur. Sur le filetage extérieur est vissée une enveloppe latérale intérieure cylindrique 41, avec filetage intérieur 42, qui est entourée, à une certaine distance, d'une enveloppe extérieure en forme de cylindre circulaire, plus longue, d'une pièce d'embouchure 4, en forme d'anneau circulaire, d'un obturateur 5. Dans l'espace annulaire situé  
20 entre l'enveloppe intérieure 41 et l'enveloppe extérieure 43 pénètrent radialement vers l'intérieur deux talons formant coins 44, qui s'étendent jusqu'au bord libre de l'enveloppe extérieure 43 et forment, avec des contre-organes qui sont sur le col du récipient, une sécurité antiretour. Sur sa périphérie extérieure, l'enveloppe extérieure 43 est munie d'un  
25 moletage axial 3. En variante, la pièce d'embouchure de forme annulaire peut venir de forme sur le col du récipient 1, ce qui supprime la nécessité du filetage et de la sécurité antiretour. Au bord supérieur de la pièce d'embouchure 4 est fixée une charnière à ruban 7, qui relie, avec possibilité de rabattement, la pièce d'embouchure 4 à un chapeau 8 de  
30 l'obturateur 5. La charnière à ruban 7 est constituée d'une large languette médiane 31, qui peut se replier et qui est flanquée de, respectivement, une languette latérale plus étroite 32. Les languettes latérales 32 sont plus longues que la languette médiane 31 et présentent une partie repliée 32a qui, selon la position du chapeau 8, fait ressort. La  
35 charnière à ruban 7 est autofermante par effet de dépassement du point

mort et, au cours de l'ouverture, fait prendre rapidement au chapeau 8 la position d'ouverture totale.

Le chapeau 8 possède une paroi supérieure de forme circulaire 9 de la périphérie de laquelle part une paroi latérale 10 fermée et sensiblement dirigée verticalement. La paroi latérale 10 est élastiquement déformable et court jusqu'à une zone aplatie 10a située en face de la charnière à ruban 7 et sensiblement circulaire. La zone aplatie 10a commence à une certaine distance sous la paroi supérieure 9, ce qui fait apparaître un talon de prise 28 pour pousser le chapeau 8 vers le haut. Cette zone aplatie porte sur sa surface intérieure, au voisinage du bord libre 12 de la paroi latérale 10, une saillie longitudinale 11, qui court parallèlement au bord 12 et dont la surface 11a tournée vers la paroi supérieure 9 est dirigée perpendiculairement à la zone aplatie 10a. La longueur de la saillie longitudinale 11 correspond à peu près à la largeur de la zone 10a. Deux portions convexes 10b, situées l'une en face de l'autre, de la paroi latérale 10 sont rugueuses ou striées sur leur surface extérieure, sur une zone ayant à peu près la forme d'un demi cercle, et servent de surface de prise pour deux doigts de l'utilisateur (figure 2).

Sur la surface intérieure de la paroi supérieure 9 sont disposées deux nervures 13, 14, qui sont en forme de plaque convergeant en direction de la charnière à ruban 7, qui s'étendent entre les côtés de la zone aplatie 10a et la charnière à ruban 7 et qui se terminent contre la paroi latérale 10. Les doigts 13, 14 raidissent la paroi supérieure 9. Sur la surface intérieure de la paroi supérieure 9 se trouve, dans la moitié opposée à la charnière à ruban 7, un bouchon obturateur creux 15, dont le bord 15a va en diminuant obliquement de l'avant vers l'arrière.

La saillie longitudinale 11, qui se trouve sur le chapeau 8, sert de contre-organe pour une saillie de crantage 20 qui se présente sous forme d'un profilé rabattu vers l'extérieur, à peu près de même longueur, dont l'aile la plus courte, dirigée vers l'extérieur, est saisie par-dessous par la saillie 11 (figure 4). La saillie de crantage 20 est prévue sur la face supérieure de la pièce d'embouchure 4 et elle est décalée vers l'intérieur, par rapport à la périphérie extérieure circulaire de cette pièce d'embouchure, de ce qu'il faut pour atteindre la zone aplatie 10a de la paroi latérale 10 du chapeau 8. La surface supérieure plane de la

pièce d'embouchure 4 est profilée par une nervure périphérique 6, qui sépare l'une de l'autre une surface annulaire périphérique 21 et une partie intérieure 22. De la partie intérieure 22 se dresse, excentré, un ver-  
 5 seur 23 qui présente la forme approximative d'un hyperboloïde à partie supérieure élancée qui se termine en un bord circulaire, pour verser ou pour verser goutte à goutte, 24, d'une ouverture 29. De la surface inférieure de la face supérieure de la pièce d'embouchure 4 pénètre vers le bas une courte jupe d'étanchéité 30. Dans la zone arrière côté charnière, la nervure 6 suit le contour en arc de cercle de la pièce d'embouchure 4,  
 10 puis se transforme en deux portions droites parallèles 25 et, après de courts tronçons à angle brisé 26, se termine à distance des extrémités de la saillie de crantage 20. Sur la face extérieure des deux portions droites de la nervure périphérique 6 est respectivement prévu un doigt 40 qui est indépendant de cette nervure et qui se dresse verticalement depuis la fa-  
 15 ce supérieure de la pièce d'embouchure 4 dans la zone de la surface annulaire 21. Chaque doigt 40 forme une sécante pour le tronçon cintré 10b de la paroi latérale 10 du chapeau 8 et il vient plus haut que la nervure 6. L'objet des doigts 40 consiste à limiter la profondeur dont on peut pousser les portions 10b de façon que, lorsqu'on les pousse, la zone apla-  
 20 tie 10a ne se courbe pas suffisamment vers l'extérieur pour que les saillies 11 et 20 se libèrent l'une de l'autre. Il subsiste une légère liaison entre les deux saillies et, pour les séparer complètement, il faut pousser avec force le chapeau 8 vers le haut. Il en résulte alors, du fait du pivotement du bouchon obturateur 15 vers l'extérieur hors du ver-  
 25 seur 23, un décalage latéral de l'axe médian du bouchon obturateur 15 par rapport à l'axe médian du verseau 23, ce qui provoque un effet de freinage supplémentaire du mouvement d'ouverture.

Lorsque le chapeau 8 est fermé, sa bordure 12 repose sur la surface annulaire 21 de la pièce d'embouchure 4 et la saillie de crantage  
 30 20 est saisie par-dessous par le contre-organe 11, avec crantage (figure 4). Le bouchon obturateur 15 se loge, avec étanchéité, dans l'ouverture 29 du verseau 23 (figure 4). Pour ouvrir l'obturateur 5, il faut pousser radialement les deux portions 10b de la paroi latérale 10 du chapeau 8 (figure 2) jusqu'à venir buter contre les doigts 40, ce par quoi la paroi  
 35 latérale 10 se déforme de façon que sa zone aplatie 10a soit un peu re-

poussée vers l'extérieur et que la prise existant entre les saillies 11 et 20 devienne lâche. Ce n'est qu'en poussant en plus vers le haut le chapeau 8 que le verrou s'ouvre et que l'on peut faire basculer le chapeau 8 autour de l'articulation à charnière 7 pour libérer l'ouverture 29.

REVENDEICATIONS

1. Obturateur pour un récipient du type bouteille ou boîte, comportant un chapeau qui est constitué d'une paroi latérale et d'une paroi supérieure, qui est fixé, avec possibilité de rabattement, à une pièce d'embouchure au moyen d'une articulation à charnière, et sur lequel,  
5 en face de l'articulation à charnière, sur la face supérieure de la pièce d'embouchure, est prévue une saillie de crantage de verrou, qui est dirigée vers le haut et vers l'extérieur et qui vient en prise, de façon amovible, avec un contre-organe, dirigé vers l'intérieur, de la paroi latérale du chapeau ; la paroi latérale du chapeau étant élastiquement déformable et pouvant se déformer lorsque l'on appuie radialement, en direction  
10 du verrou, sur deux portions situées en face l'une de l'autre, caractérisée par le fait que, sur la face supérieure de la pièce d'embouchure (4), au voisinage des deux portions de chapeau (10b), est respectivement disposé un doigt (40), qui se dresse verticalement, pour limiter la profondeur à laquelle on peut pousser les portions du chapeau (10b).  
15

2. Obturateur selon la revendication 1, caractérisé par le fait que la paroi latérale (10) du chapeau (8) est convexe dans la zone des deux portions (10b), et que les doigts (40) passent tout droit, comme sécantes de la forme convexe.

20 3. Obturateur selon la revendication 1 ou 2, caractérisé par le fait que le chapeau (8) et la pièce d'embouchure (4) sont ronds, en particulier de forme circulaire, que la paroi latérale (10) du chapeau (8) est aplatie dans la zone (10a) du contre-organe (11), et que la saillie de crantage (20) est décalée vers l'intérieur de façon appropriée par rapport à la périphérie de la pièce d'embouchure (4).  
25

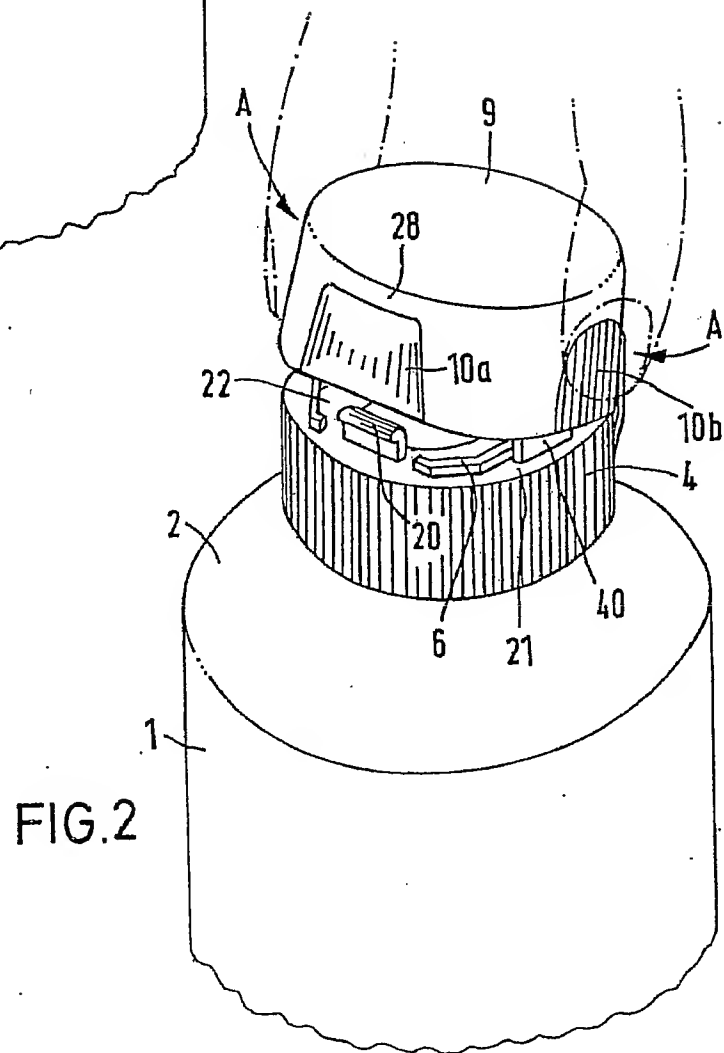
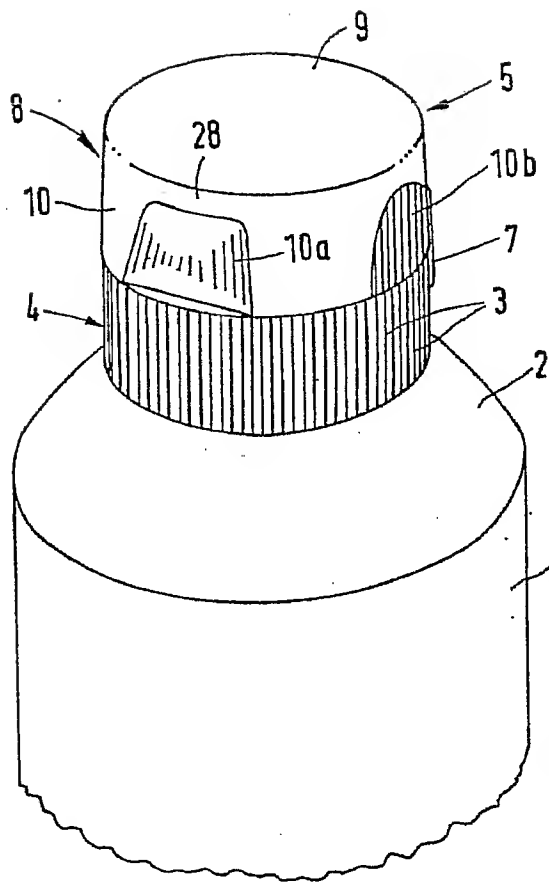
4. Obturateur selon l'une des revendications 1 à 3, caractérisé par le fait qu'un verreur excentré (23) se dresse verticalement depuis la face supérieure de la pièce d'embouchure (4), et que sur la surface intérieure de la paroi supérieure (9) du chapeau (8) est disposé un bouchon obturateur excentré (15), qui plonge dans l'ouverture du verreur (29).  
30

5. Obturateur selon la revendication 4, caractérisé par le fait que le bord libre du bouchon obturateur (15) est chanfreiné et va en décroissant en direction du côté du chapeau (8) où se trouve l'articulation à charnière (7).

35 6. Obturateur selon l'une des revendications 1 à 5, caractérisé

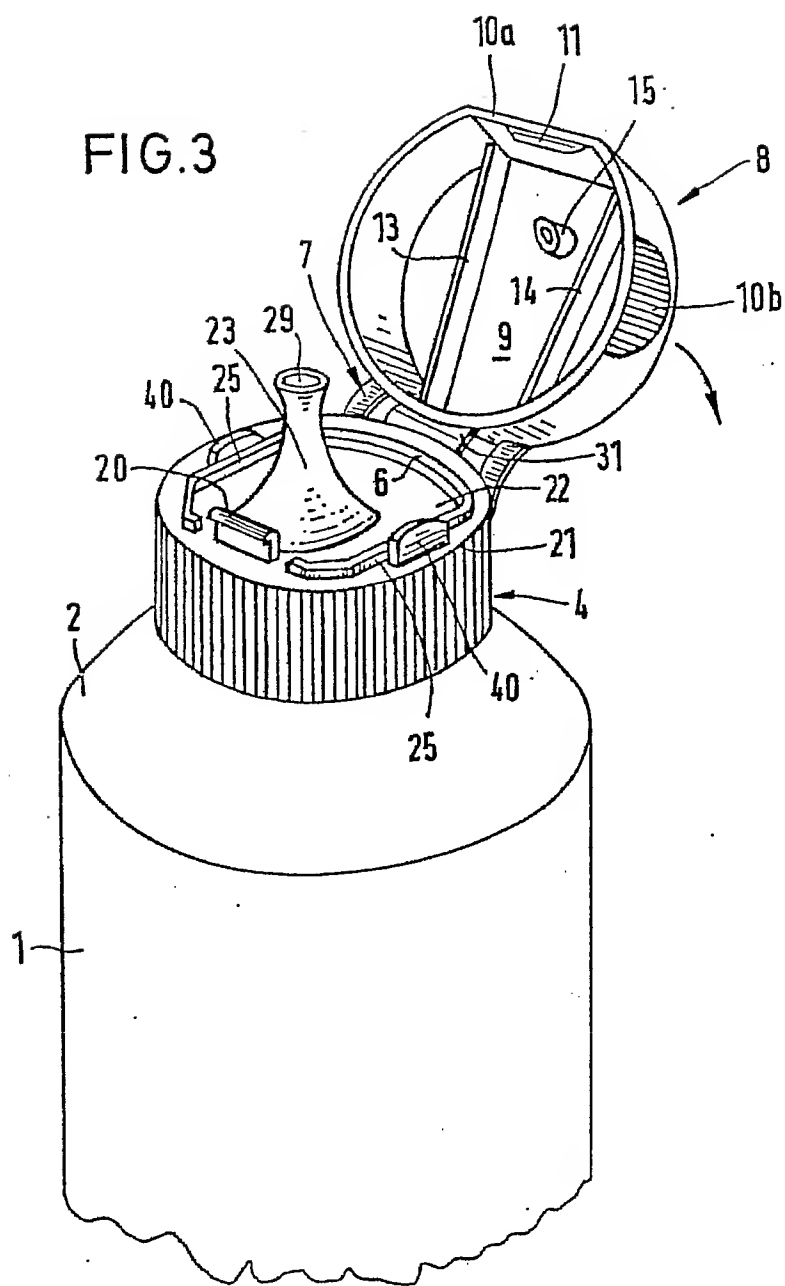
par le fait que la pièce d'embouchure (4) et le chapeau (8) sont fabriqués en une matière plastique, et que l'articulation à charnière (7) est une charnière à ruban autofermante.

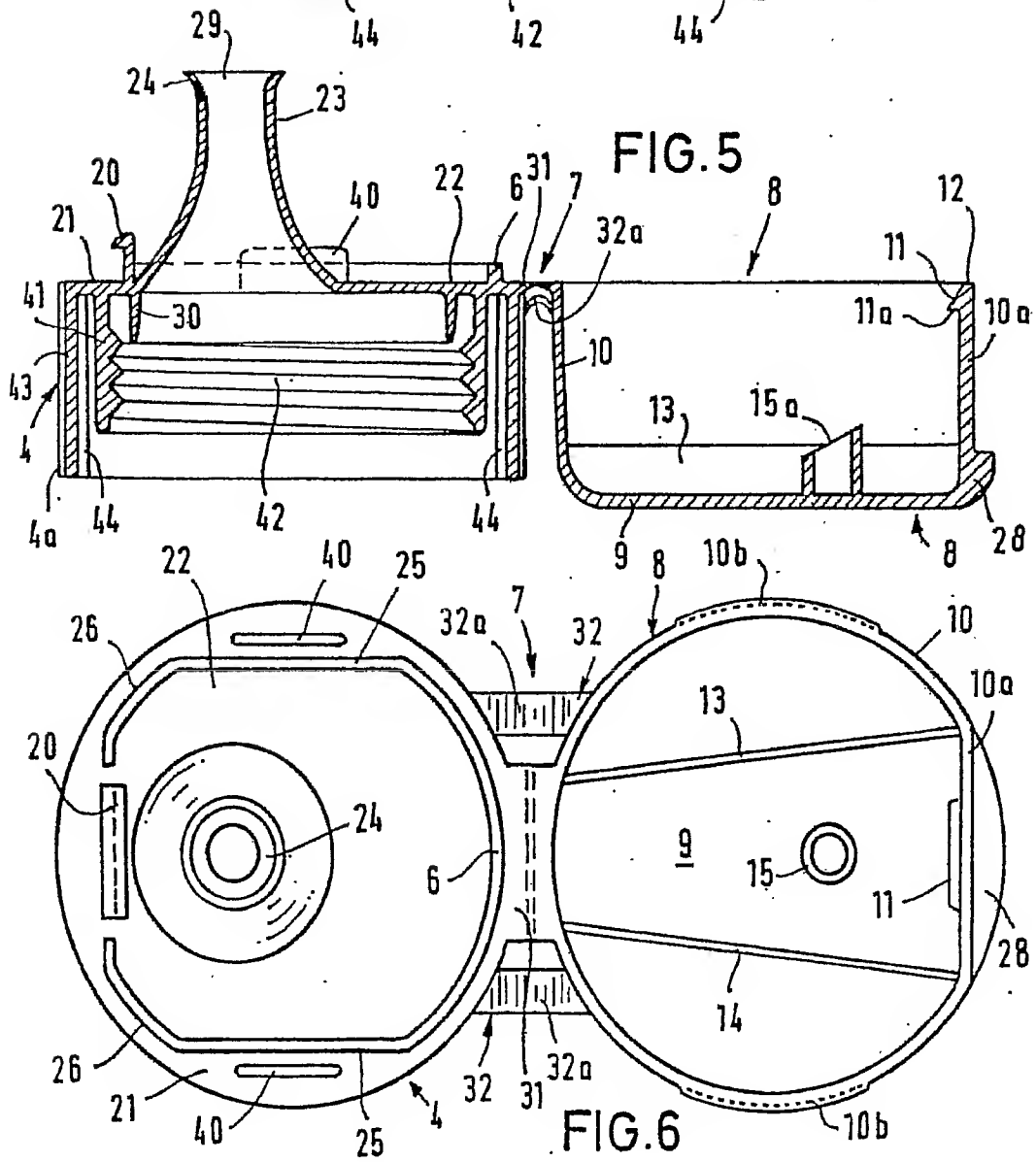
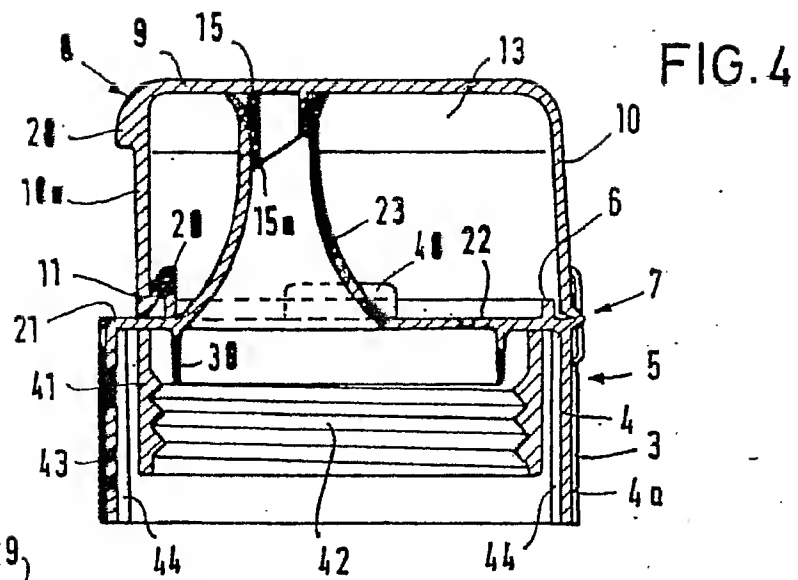
7. Obturateur selon l'une des revendications 1 à 6, caractérisé
- 5 par le fait que la pièce d'embouchure (4) a la forme d'un corps à visser avec sécurité antiretour.



12

FIG. 3







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(54) **DISPENSING CLOSURE**

ABGABEVERSCHLUSS

OBTURATEUR D'EMBOUCHURE

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**GB-A- 1 484 517** **US-A- 3 603 470**  
**US-A- 5 683 016**

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## Description

[0001] The present invention concerns a dispensing closure, having a body and a lid. The body defines a dispensing orifice through which the contents of a container, to which the closure is attached, may be dispensed. The lid is attached to the body by a hinge, which allows the lid to swing between a closed position, in which the lid occludes the dispensing orifice, to an open position, in which the dispensing orifice is exposed and the contents of the container may be dispensed. In particular, the dispensing closure according to the present invention is a child resistant dispensing closure and includes a catch to lock the lid in its closed position. The lid can only be opened, upon application of two discrete, dissimilar movements, simultaneously by a user. This is generally considered difficult for a child to achieve and is unlikely to result in the closure being opened accidentally.

[0002] A child resistant closure of this general type is disclosed in US-A-4790442. This patent describes the need for two different and dissimilar movements to prevent the lid from being opened by a child. This patent also discusses the desirability of providing alignment between the adjacent surfaces of the body and the lid, to prevent the lid from being easily grasped to exert an opening force on the lid. In the closure described in this patent, a user must first squeeze radially inwardly, on the two opposing sides of the lid on either side of the hinge, to expose an edge opposite the hinge, by which the lid may then be lifted. This squeezing movement also temporarily releases a catch.

[0003] The lid of the closure described in US-A-4790442 has a generally planar top plate with a downwardly depending sidewall. An arcuate slot extends through the top plate opposite the hinge and adjacent to the sidewall. The slot allows the sidewall of the lid to be squeezed at two diametrically opposed points, thereby displacing a portion of the sidewall opposite the hinge. This displacement releases a catch and also provides an overhang on the lid relative to the body, by which the lid may be lifted.

[0004] A disadvantage of this arrangement is that the top plate of the closure does not support the distorted portion of the sidewall. The arcuate slot subtends an angle of at least 180°, to allow the necessary deformation of the sidewall. However, during the second stage of the opening movement, a user must lift the lid by this unsupported section of sidewall, which will be difficult and will result in axial movement of the sidewall relative to the planar top plate. Repeated movement will lead to damage of the unsupported sidewall and may render the catch (which is carried by this portion of the lid) ineffective.

[0005] Other child resistant closures are known from GB-A-1484517, FR-A-2591571, US-A-3,603,470 and WO-A-99/57031.

[0006] A further disadvantage of this arrangement is that, unlike the sidewalls of the lid and the body, which

join to form a continuous surface, the top plate of the sidewall is disjointed by the arcuate slot. This slot may collect dirt or may be used to prise open the closure using the teeth for example, which will further reduce the effectiveness of the closure.

[0007] The closure according to the present invention, overcomes these disadvantages by providing a dispensing closure having a lid that includes a top plate, which covers the ring in both its normal and deformed states and in its deformed state. The ring unlocks the catch temporarily, whilst defining a lifting tab to allow the lid to be moved to its open position.

[0008] In the closure according to the invention, the top plate of the closure has a smooth surface with no cavities therein to trap dirt or other foreign objects and cannot be easily manipulated to overcome the catch arrangement. Furthermore, the lifting region of the ring is supported by the top plate and when a user applies axial force to the lifting region to lift the lid, the ring, is braced by the top plate, making the lid easier to open.

[0009] In use, a user squeezes the ring on either side of the hinge, ovalising the ring, which causes the catch to be released and also provides an overhang portion relative to the body, opposite the hinge. In order to open the closure, a lifting force must be applied simultaneously with the squeezing force required to release the catch and provide the overhang portion. If the squeezing force is released before the lifting force is applied, the catch will re-engage and the resilient ring will relax obliterating or at least minimising the overhang portion. This will make it difficult to open the lid. The two discrete, dissimilar movements, simultaneously applied, prevent the closure from being opened easily by a child.

[0010] In one aspect, the invention provides a dispensing closure comprising a body for connection to a container, a lid moveable relative to the body between open and closed positions, the lid including a top plate and sidewalls, a catch arranged to lock the body and the lid together, when the lid is in its closed position, a resilient ring having a normal and deformed state, wherein the top plate covers the ring in both its normal and deformed states, and in its deformed state the resilient ring unlocks the catch, whilst defining a lifting tab, to allow the lid to be moved to its open position, characterised in that the resilient ring is carried inside the lid and the lid includes a plurality of windows through which the resilient ring may be pressed to cause deformation.

[0011] The windows may be provided in the sidewall and/or the adjacent top plate of the lid. A separate, resilient ring is fixed inside the lid and portions of this ring protrude through the windows to allow the ring to be squeezed laterally on either side of the hinge. On squeezing, the portion of the resilient ring opposite the hinge protrudes radially outwardly, through another window in the sidewall, and thereby releases the catch and provides a lifting region, by which the lid may be lifted and opened.

[0012] This design may be enhanced by providing tabs attached to the resilient ring, arranged to protrude

through the windows. The tabs may be further enhanced by including finger recesses, to improve the ease with which the ring may be laterally squeezed by a user. Furthermore, the lifting region may be provided by a further tab, which projects from the lid as the ring is deformed, to improve the ease of lifting and opening the lid, after the ring is deformed by squeezing.

**[0013]** This embodiment combines the advantage of a freely deformable resilient ring, which is unconstrained by the lid or the sidewall, whilst ensuring that the ring is completely surrounded by a top plate and sidewall of the lid to achieve a substantially smooth surface. It will be understood that the ring and windows may be designed to enhance the smooth, contiguous flow of the surface of the closure.

**[0014]** The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows an isometric view (looking from the top) of a closure with the lid in its open position.

Figure 2 shows an exploded, isometric view (looking from the top) of the same closure as that shown in Figure 1, with the lid open and separate top plate (not yet assembled).

Figure 3 shows a plan view of the closure shown in Figures 1 and 2, with the lid in its closed, normal position.

Figure 4A shows a plan view of the closure shown in Figure 2, with the lid in its deformed position.

Figure 4B shows the same plan view as Figure 4A, with the separate top plate removed.

Figure 5 shows a side view of an alternative one-piece closure having a lid comprising a top plate with an integral sidewall depending from the periphery thereof.

Figure 6 shows an isometric view (looking from the top) of the same closure shown in Figure 5, with the lid in its open position.

Figure 7 shows an isometric view of the closure shown in Figures 5 and 6 with the lid in its closed, normal position.

Figure 8 shows the same closure as shown in Figure 7 in its closed, deformed position.

Figure 9 shows an isometric view of another closure (similar to the closure shown in Figures 5 to 8), with its lid in a closed, normal position and having shield elements.

Figure 10 shows an isometric view the same closure shown in Figure 9 in its open position.

Figure 11 shows an isometric view of yet another closure, with its lid in a closed, normal position and having an alternative design of shield elements.

Figure 12 shows an isometric view of the closure shown in Figure 11, with the lid in its open position.

Figure 13 shows a side view of a closure according to the invention, having tabs, which protrude through windows in the sidewall/lid of the closure.

Figure 14 shows an isometric view (looking from the top) of the closure shown in Figure 13, with the lid in its open position.

Figure 15 shows an exploded view of the closure shown in Figures 13 and 14.

Figure 16 shows a plan view of the closure shown in Figures 13 to 15, with the lid in its closed, normal position.

Figure 17 shows a plan view of the closure shown in Figures 13 to 16, with the lid in its deformed position.

**[0015]** In the attached description the closure is described in relation to an "upright" orientation, where the main axis of the closure is aligned to the vertical and the body of the closure lies vertically below the lid. Wherever possible like parts have been designated using the same reference numerals.

**[0016]** Referring to the attached Figures, a dispensing closure 1 generally comprises a body 2 and a lid 3. The body 2 is adapted to be connected to a container (not shown) by means of mutually co-operating screw threads or snap beads, for example. Preferably, the connection between the body 2 and the container is a permanent connection, which prevents easy removal of the closure 2 from the container. Instead, the body 2 has a dispensing orifice 28, through which the contents of the container may be dispensed. The lid 3 has a top plate 31, from which a sidewall 32 depends downwardly and a plug 38, designed to co-operate with the dispensing orifice 28. A hinge 5 connects the lid 3 to the body 2, and allows the lid 3 to be moved swingingly between a closed position in which the plug 38 occludes the dispensing orifice 28 and an open position, in which the dispensing orifice 28 is unobstructed and the contents of the container may be dispensed.

**[0017]** In this closure (see Figures 1 and 2), the top plate 31 is formed as a separate component to the remainder of the lid 3, which comprises an inner central panel 33 and a sidewall 32. The plug 38 is carried on the inner central panel 33.

**[0018]** The sidewall 32 of the lid 3 is connected to the inner central panel 33 by rigid arms 35 adjacent to the hinge 5 and resilient curved arms 36 distant from the hinge 5 (see Figures 2 and 3). The number and position of the curved arms 36 are chosen to hold the sidewall 32 firmly to the inner central panel 33, and act to limit undesirable axial movement as the lid is opened and closed. The resilient curved arms provide a degree of resistance to the squeezing movement of the user required to deform the sidewall 33, without preventing the deformation thereof altogether. This limited resistance is expected by a user, to provide feedback about the degree of squeezing force applied.

**[0019]** A separate top plate 31 is fixed to the upper surface of the lid 3, by means of a hole 332 and spigot 312 joint (as shown in Figure 2). The hole 332 and spigot 312 joint is designed to be permanent, once assembled

and the separate top plate 31 is difficult to remove from the inner central plate 33 of the lid 3.

[0020] In this closure, the sidewall 32 provides the resilient ring 4 and carries one part of the catch 6. The other part of the catch 6 is carried on the body 2. As shown in Figure 1, the catch 6 comprises a tab 61, which engages in a slot 62. In Figure 1, the tab is shown carried on the resilient ring 4 and the slot is defined in the body 2, but these two parts of the catch 6 may be reversed. Alternatively, the catch 6 may comprise two inter-engaging tabs rather than a tab and a slot.

[0021] Figure 3 shows a plan view of the closure 1, in its closed, normal position. As shown, in this position the separate top plate 31 covers the whole of the upper surface of the resilient ring 4. Referring to Figures 4A and 4B, to open the closure, a user squeezes the resilient ring on either side of the hinge 5. On squeezing, the ring 4 deforms (ovalises) and thereby releases the tab part of the catch 61 from the slot 62. Also, the deformed ring 4 creates an overhang 65 on the lid 3 with respect to the body 2. This overhang 65 is used to lift the lid 3, disengaging the plug 38 from the dispensing orifice 28. It should be noted that on ovalising, the deformed ring 4 unlocks the lid but does not open the lid 3. A second separate and distinct lifting movement must be applied by the user simultaneously with the squeezing movement.

[0022] Figures 5 and 6 show an alternative closure, having the same general structure as that described above. The closure 1 comprises a body 2, for fixing to a container (not shown), and a lid 3 connected together by a hinge 5. Again the lid 3 comprises a top plate 31 with a sidewall 32, depending downwardly from the periphery thereof. The sidewall 32 provides the resilient ring 4, but in this closure, the top plate 31 and sidewall 32 are moulded integrally (as a single component). This allows high volume production, but the integral nature of the top plate 31 and the side wall 32 means that the top plate 31 inhibits deformation of the ring 4/sidewall 32.

[0023] In fact, it has been found that when the sides of the ring 4/sidewall 32 are squeezed by a user, the ring 4/sidewall 32 has two components of deformation. Radial deformation, which is required to unlock the catch 6 and provide the lifting region 65 required according to the invention, and axial deformation, which is undesirable because the side wall 32 presses against the adjacent surface of the body 2 and tends to lift the lid 2. In this closure this problem is overcome by leaving a gap 7 between the free edge of the side wall 32 and the adjacent surface of the body 2, which is sized such that the axial deformation of the ring 4/sidewall 32 can be accommodated, without lifting the lid 3.

[0024] A plurality of ribs 37 is also provided between the top plate 31 and sidewall 32 to allow the closure to resist any axial top load. The ribs 37 are sized and positioned to stabilise the lid 2, should it be subjected to a top load, during transport, for example.

[0025] Referring to Figures 7 and 8, to open the closure

1, a user again squeezes either side of the lid 2 to deform the resilient ring 4/side wall 32. In this closure the sidewall 32 is constrained at its top edge by the top plate 31. Thus, the squeezing movement tends to push the sidewall 32 radially inwardly and downwardly (as shown in Figure 8). As described in relation to the previous closure the squeezing movement unlocks a catch (not shown in Figures 7 and 8) and also provides a lifting region 65, by which the lid 3 may be lifted.

[0026] This closure may be further enhanced by providing a shield 71, to cover the gap 7 and provide a smooth surface to the closure 1 (as shown in Figures 9 and 10). The shield 71 is preferably interrupted at the hinge 5 and the opposing portion of the side wall 32 (adjacent to the catch 6), to allow room for outward radial movement of the side wall 32, required to unlock the catch 6 between the body 2 and the lid 3.

[0027] In a variation (see Figures 11 and 12), the shield portions 71 may be extended to provide finger pads, which the user may use to indirectly squeeze the sidewall 32 of the lid 3. This arrangement has the advantage that the user is unaware of the radially inward tilting of the free edge of the sidewall 32 (shown in Figure 8), when squeezing pressure is applied to the pads. In this arrangement, the shield portions 71 may be relieved (for example, cut away or flared outwardly) in the vicinity of the hinge 5, to allow unrestricted opening and closing of the lid 3 on the body 2.

[0028] Referring to the closure shown in Figures 13 to 15, the lid 3 of the closure 1 is formed in one piece and is again connected to a body 2 via a hinge 5. A plurality of windows 39 is defined in the lid 2 in the sidewall 32 and/or top plate 31. A separate resilient ring is assembled inside the lid 2 by a known permanent joint arrangement (e.g. hole and splgot arrangement as previously described and as shown in Figures 14 and 15). The permanent joint between the lid 3 and the resilient ring 4 is designed to allow free deformation of the majority of the ring 4. In other words, the ring 4 is preferably attached to the lid 2 at one point only.

[0029] A pair of squeeze tabs 41 may be carried on the ring, such that they protrude through the windows 39. Preferably, the squeeze tabs 41 are shaped to accommodate a user's fingers comfortably. A lifting tab 65 is also carried on the ring 4, opposite the hinge 5 and may protrude through an associated window 39 in the sidewall 32 of the lid 3.

[0030] Referring to Figures 16 and 17, a user who wants to gain access to the contents of the container squeezes the squeeze tabs 41, deforming the ring 4 and unlocking the catch 6. As illustrated in Figure 17, the deformation of the ring also causes a lifting portion 65 to protrude from the lid 2, opposite the hinge, allowing the lid 2 to be lifted and thereby opened.

[0031] The examples described above are included as illustrative of the present invention only and other resilient ring designs, falling within the scope of the claims, will be apparent to the man skilled in the art, without departing

from the general teaching of the invention.

## Claims

1. A dispensing closure (1) comprising a body (2) for connection to a container, a lid (3) moveable relative to the body between open and closed positions, including a top plate (31) and sidewalls (32), a catch (6) arranged to lock the body (2) and the lid (3) together when the lid is in its closed position, a resilient ring (4) having a normal and deformed state, wherein the top plate (31) covers the ring in both its normal and deformed states, and in its deformed state the resilient ring (4) unlocks the catch (6) whilst defining a lifting tab (65), to allow the lid (3) to be moved to its open position, **characterised in that** the resilient ring (4) is carried inside the lid (3) and the lid (3) includes a plurality of windows (39) through which the resilient ring (4) may be pressed to cause deformation.
2. A child resistant closure according to Claim 1, wherein at least part of the catch is carried on the resilient ring.
3. A dispensing closure according to either of Claims 1 and 2, wherein the plurality of windows (39) are provided in the sidewall (32) of the lid (3), finger tabs are carried by the resilient ring, and the finger tabs (41) protrude through the windows making it easier for a user to deform the resilient ring (4).
4. A dispensing closure according to Claim 3, wherein two substantially diametrically opposed finger tabs (41) are provided to allow a user to squeeze the resilient ring (4), thereby deforming it to unlock the catch and expose the lifting tab (65).
5. A dispensing closure according to any preceding claim, wherein the external surface of the closure is adapted to be smooth and continuous.

## Patentansprüche

1. Spenderverschluss (1) bestehend aus einem Körper (2) für den Anschluss an einen Behälter, einem Deckel (3), der relativ zum Körper zwischen einer offenen und einer geschlossenen Stellung bewegbar ist, einschließlich einer Oberplatte (31) und Seitenwänden (32), einer Arretierung (6) für die Zusammenriegelung des Körpers (2) und des Deckels (3), wenn sich der Deckel in geschlossene Stellung befindet, einem nachgiebigen Ring (4) mit einem normalen und einem verformten Zustand, wobei die Oberplatte (31) den Ring sowohl in seinem normalen als auch in seinem verformten Zustand bedeckt, und wobei

der nachgiebige Ring (4) in seinem verformten Zustand die Arretierung (6) löst und dabei eine Hebelasche (65) bildet, damit der Deckel (3) in seine geöffnete Stellung bewegt werden kann,

- dadurch gekennzeichnet, dass** der nachgiebige Ring (4) innerhalb des Deckels (3) verläuft und der Deckel (3) eine Mehrzahl an Fenstern (39) aufweist, durch die der nachgiebige Ring (4) gedrückt werden kann, um die Verformung zu bewirken.
2. Kindersicherer Verschluss gemäß Anspruch 1, **dadurch gekennzeichnet, dass** mindestens ein Teil der Arretierung auf dem nachgiebigen Ring verläuft.
3. Spenderverschluss gemäß Anspruch 1 oder Anspruch 2, **dadurch gekennzeichnet, dass** die Mehrzahl an Fenstern (39) in der Seitenwand (32) des Deckels (3) angebracht ist, dass der nachgiebige Ring Fingerlaschen (41) aufweist und die Fingerlaschen (41) durch die Fenster hindurchragen, um dem Benutzer zu erleichtern, den nachgiebigen Ring (4) zu verformen.
4. Spenderverschluss gemäß Anspruch 3, **dadurch gekennzeichnet, dass** zwei im Wesentlichen diametral entgegengesetzte Fingerlaschen (41) so angeordnet sind, dass sie einem Benutzer ermöglichen, den nachgiebigen Ring (4) zu quetschen und ihn dabei so zu verformen, dass er die Arretierung löst und die Hebelasche (65) freigibt.
5. Spenderverschluss gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Außenfläche des Verschlusses so ausgebildet ist, dass sie glatt und kontinuierlich ist.

## Revendications

1. Obturateur - débiteur (1) comprenant un corps (2) pour connection avec un conteneur, un couvercle (3) déplaçable par rapport au corps entre des positions ouverte et fermée, incluant une plaque supérieure (31) et des parois latérales (32), un crochet (6) apte à verrouiller le corps (2) et le couvercle (3) ensemble lorsque le couvercle (3) est dans sa position fermée, un anneau résilient (4) possédant un état normal et un état déformé, dans lequel la plaque supérieure (31) recouvre l'anneau à la fois dans son état normal et dans son état déformé et l'anneau résilient (4), dans son état déformé, déverrouille le crochet (6) pendant qu'il définit un onglet de soulèvement (65), pour permettre le déplacement du couvercle (3) dans sa position ouverte, **caractérisé en ce que** l'anneau résilient (4) est porté à l'intérieur du couvercle (3) et le couvercle (3) possède une pluralité de fenêtres (39) à travers lesquelles l'anneau résilient (4) peut être pressé afin de cause une défor-

mation.

2. Obturateur à l'épreuve des enfants selon la revendication 1, dans lequel au moins une portion du crochet est portée sur l'anneau résilient. 5
3. Obturateur - débiteur selon la revendication 1 ou 2, dans lequel la pluralité de fenêtres (39) est fournie sur la paroi latérale (32) du couvercle (3), des onglets tactiles sont portés par l'anneau résilient, et les onglets tactiles (41) dépassent à travers les fenêtres, facilitant la déformation de l'anneau résilient (4) par un usager. 10
4. Obturateur - débiteur selon la revendication 3, dans lequel deux onglets tactiles (41) qui sont essentiellement opposés diamétralement, sont prévus pour permettre le pressage de l'anneau résilient (4) par un usager, le déformant ainsi pour déverrouiller le crochet et exposer l'onglet de soulèvement (65). 15 20
5. Obturateur - débiteur selon l'une des revendications précédentes, dans lequel la surface externe de l'obturateur est adaptée pour être lisse et continue. 25

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Fig.1.

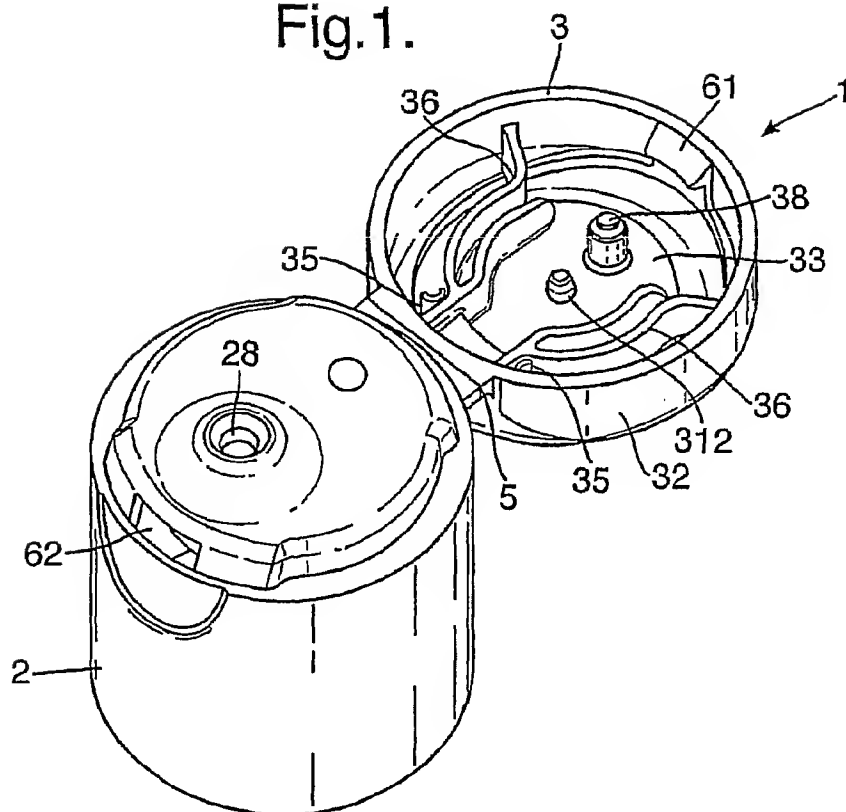


Fig.2.

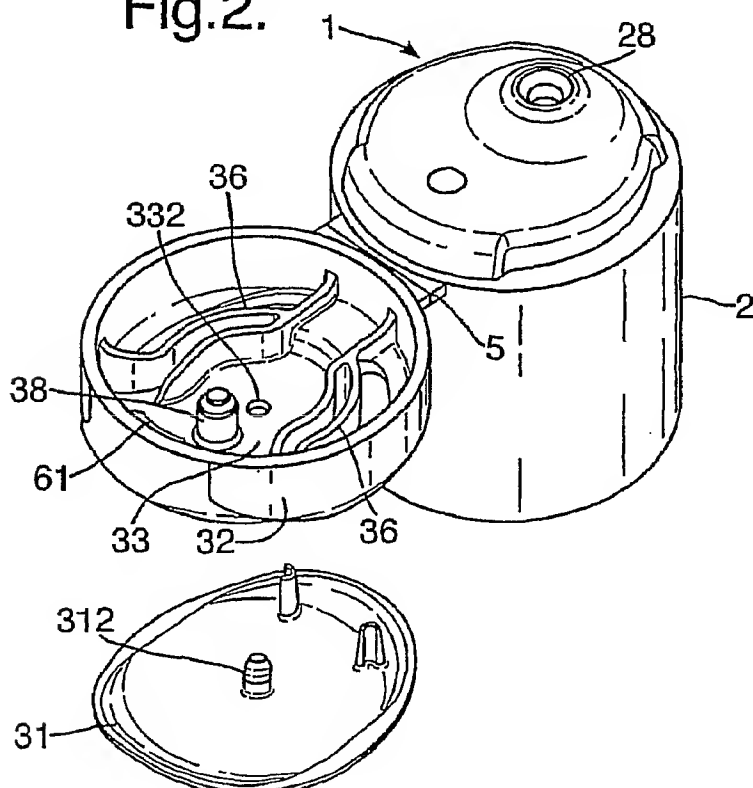


Fig.3.

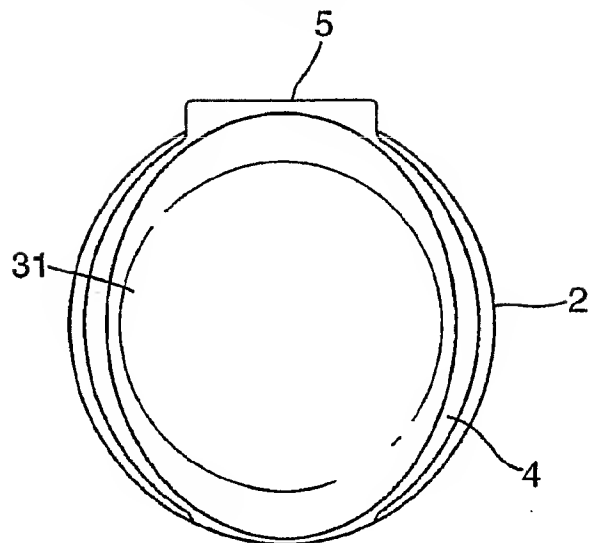


Fig.4A.

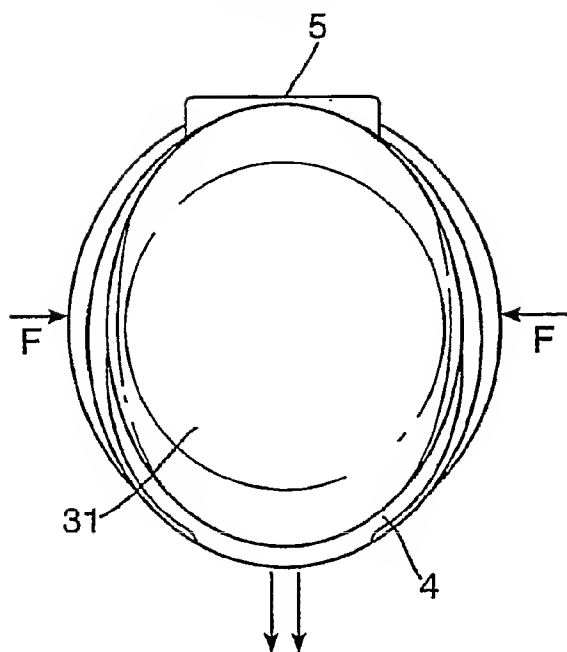


Fig.4B.

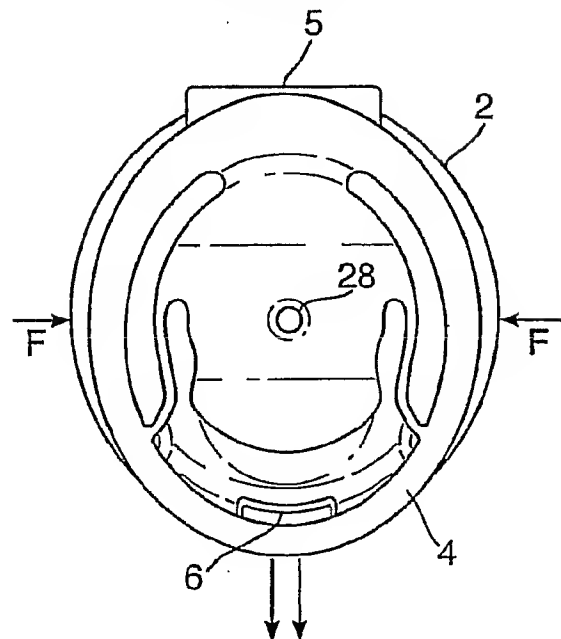


Fig.5.

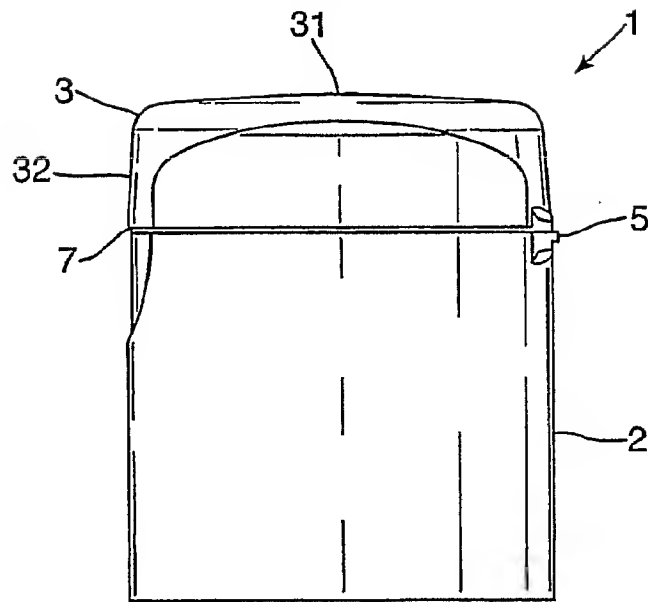


Fig.6.

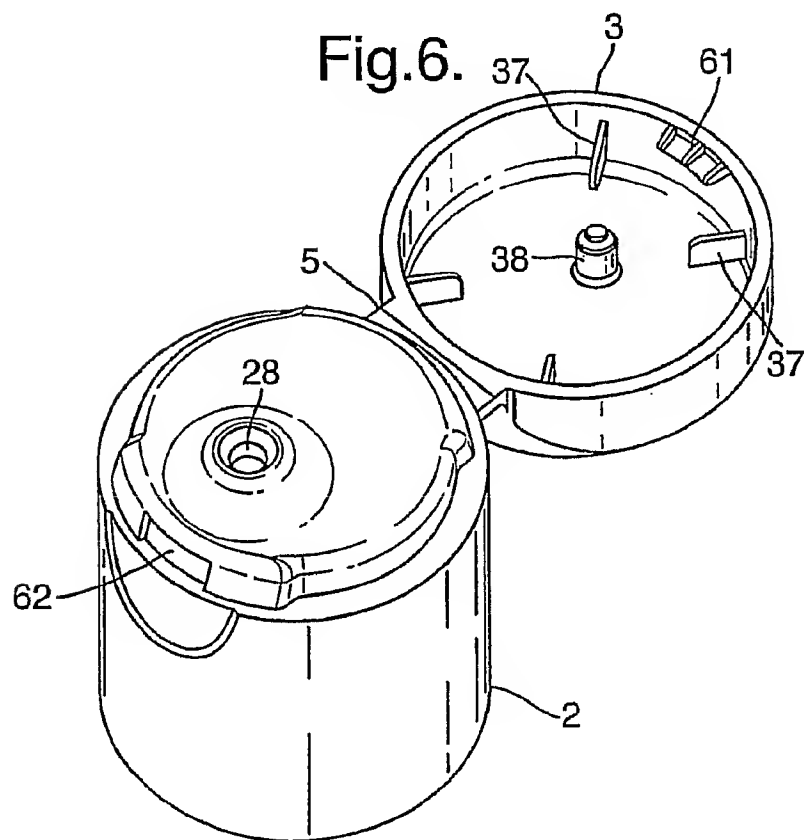


Fig.7.

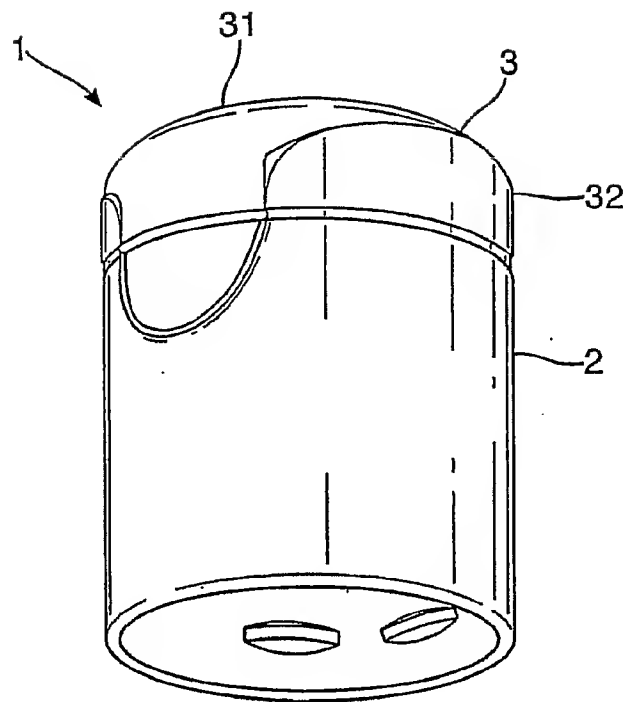
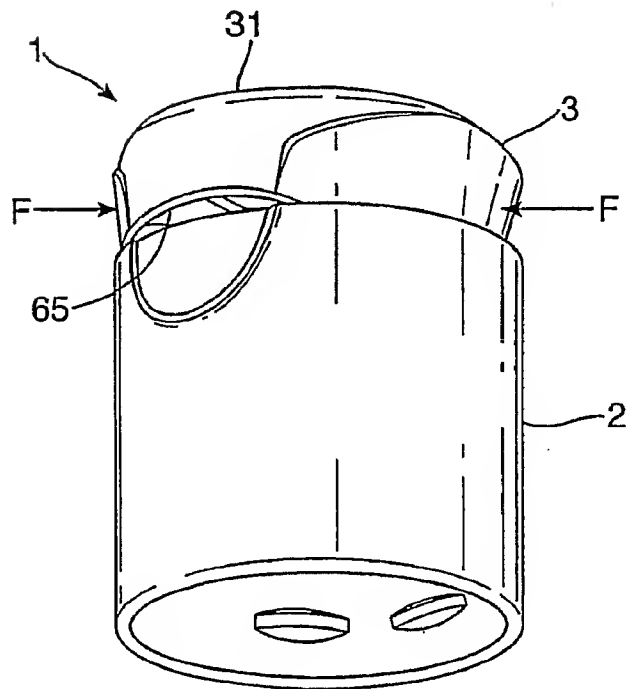


Fig.8.



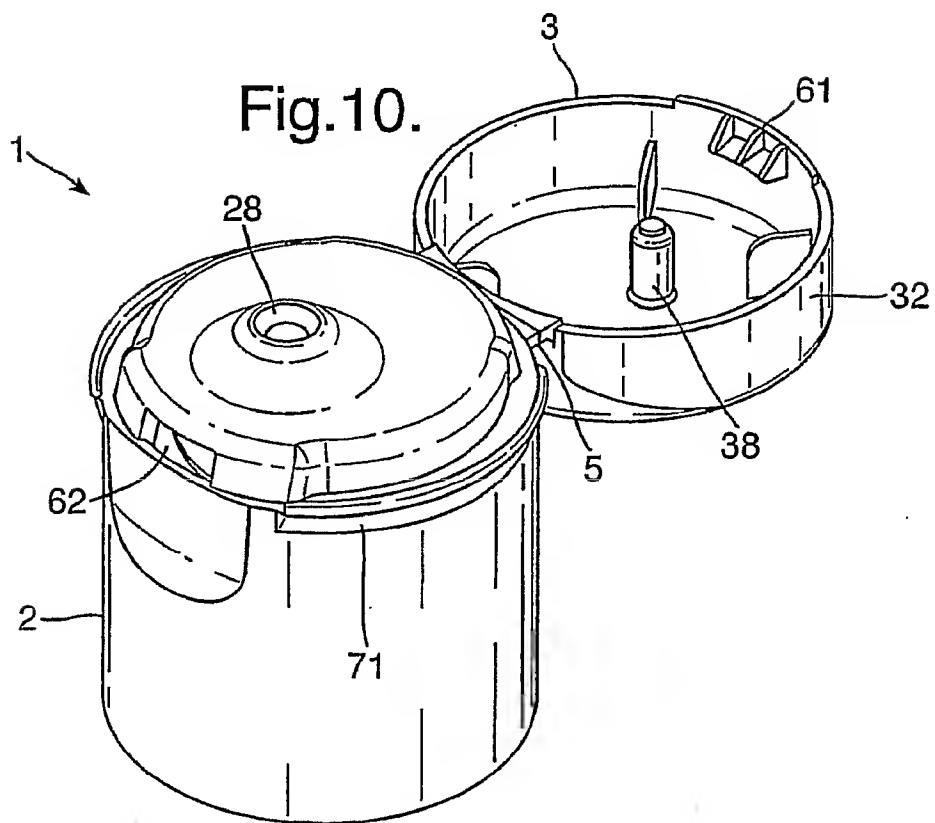
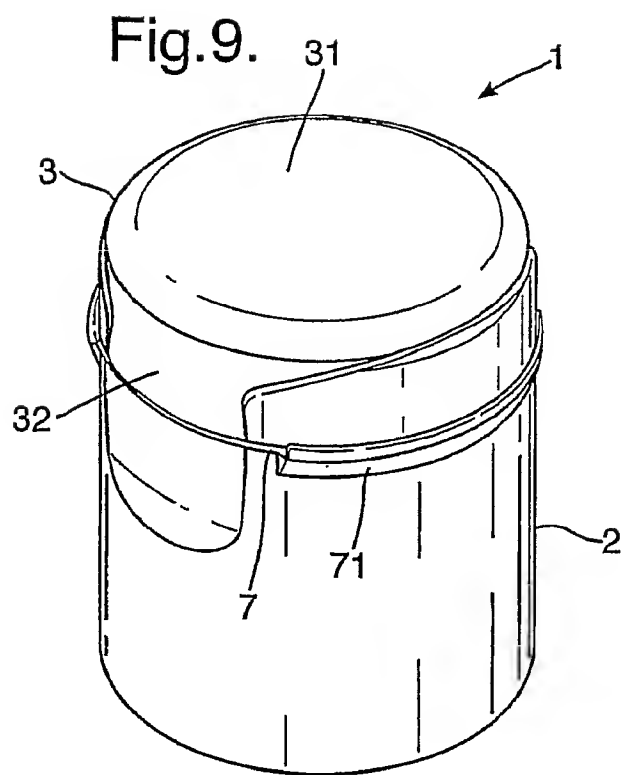


Fig.11.

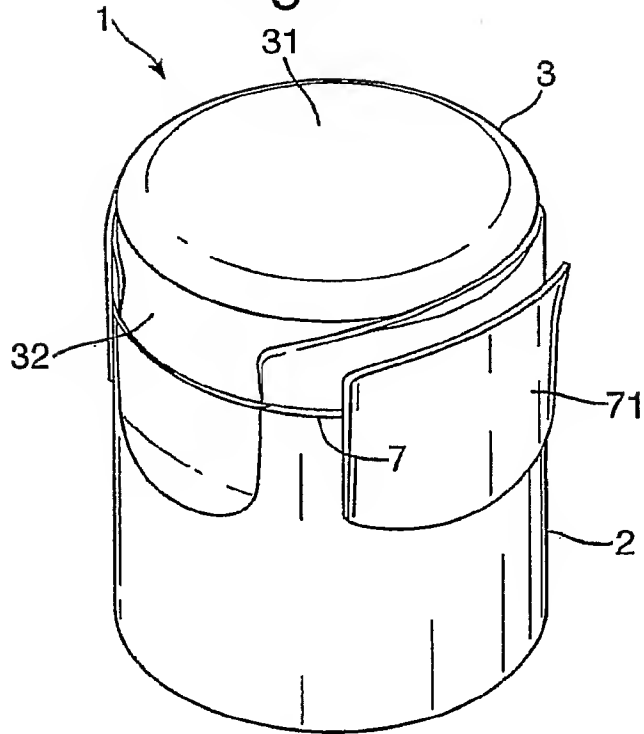


Fig.12.

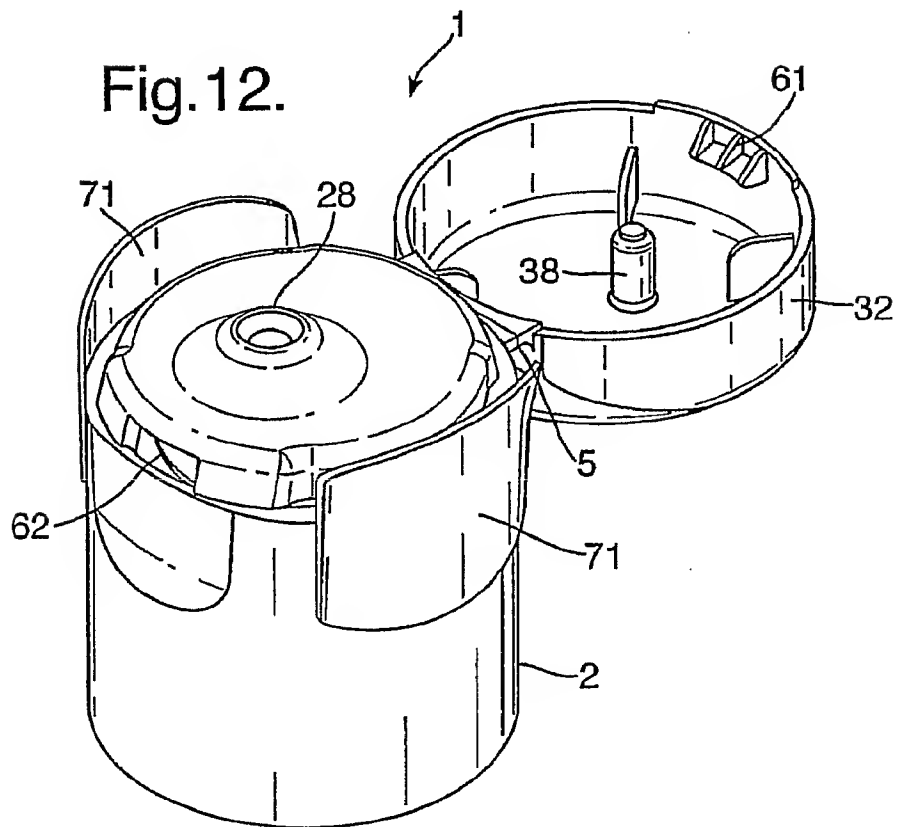


Fig.13.

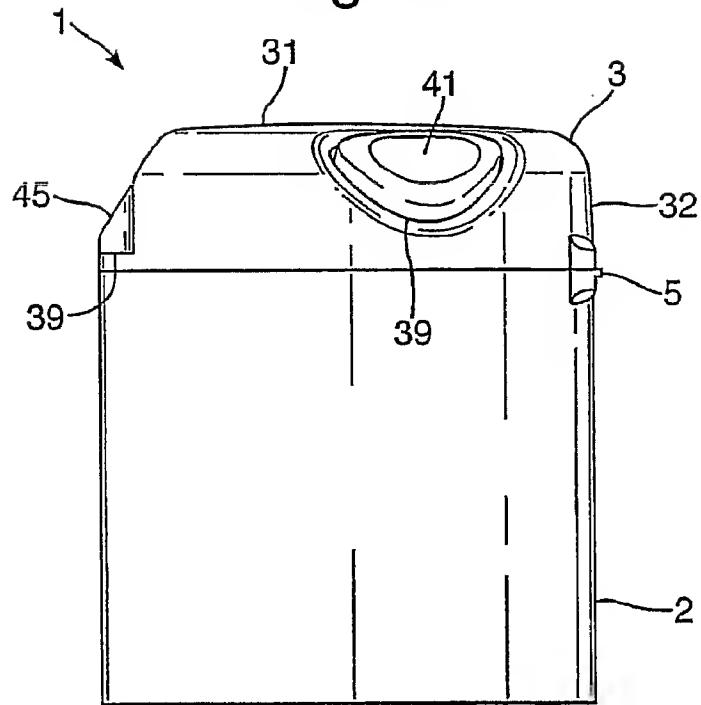


Fig.14.

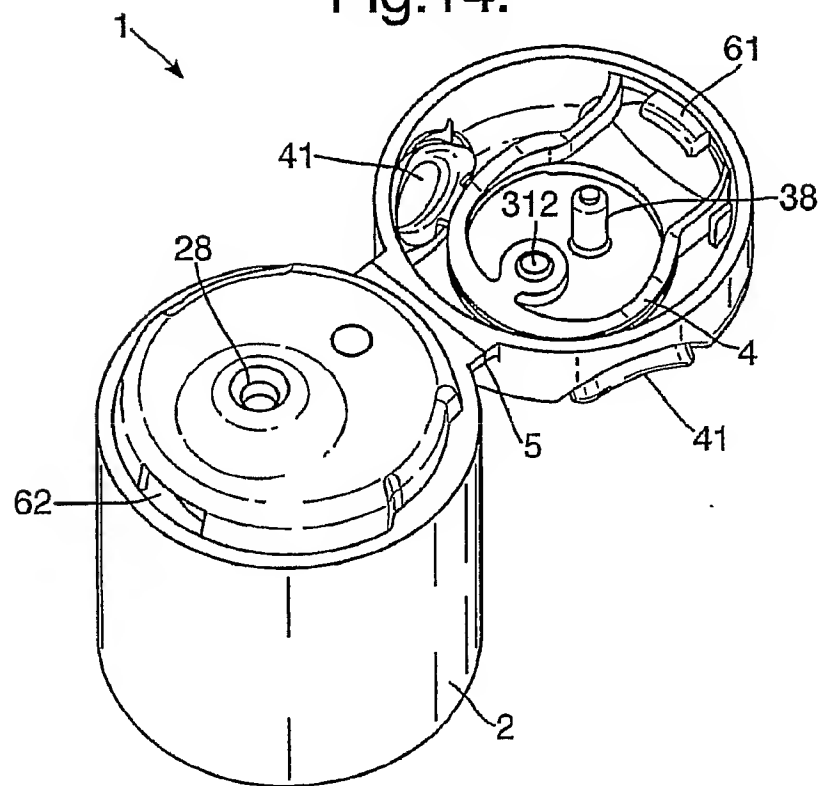


Fig.15.

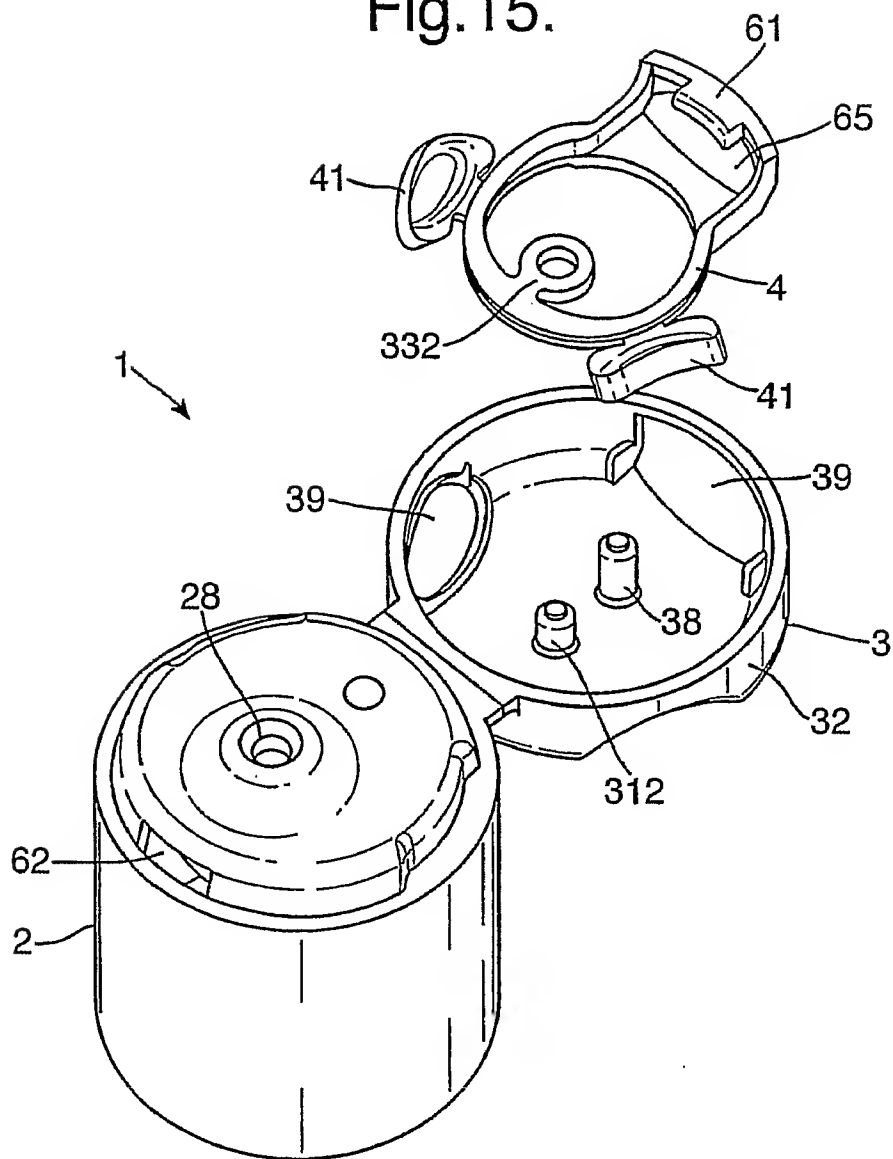


Fig.16.

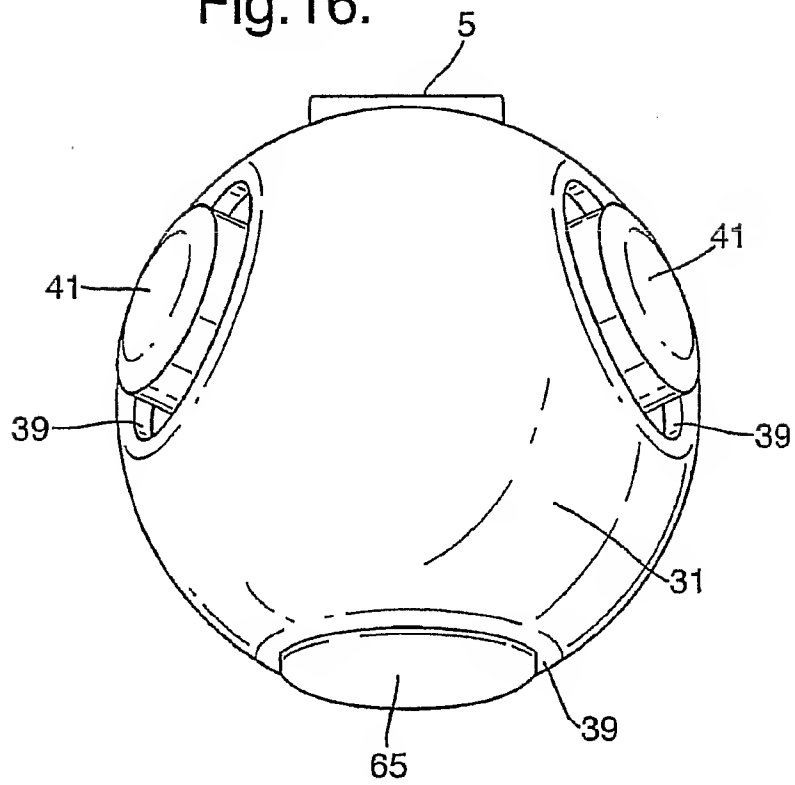
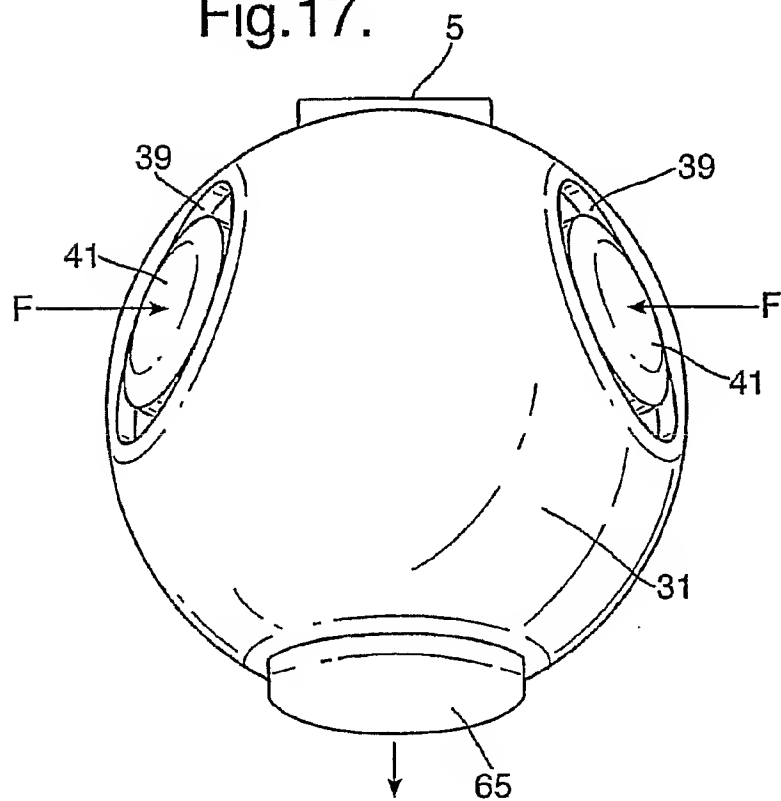


Fig.17.



REFERENCES CITED IN THE DESCRIPTION

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- GB 1484517 A [0005]
- FR 2591571 A [0005]
- US 3603470 A [0005]
- WO 9957031 A [0005]



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Patentanmeldung Nr. Patent application No. Demande de brevet n°

04253917.1

Der Präsident des Europäischen Patentamts;  
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets  
p.o.

R C van Dijk





Anmeldung Nr:

Application no.: 04253917.1

Demande no:

Anmeldetag:

Date of filing: 30.06.04

Date de dépôt:

Anmelder/Applicant(s)/Demandeur(s):

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:

(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.

If no title is shown please refer to the description.

Si aucun titre n'est indiqué se référer à la description.)

DISPENSING CLOSURE

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s)  
revendiquée(s)

Staat/Tag/Aktenzeichen/State/Date/File no./Pays/Date/Numéro de dépôt:

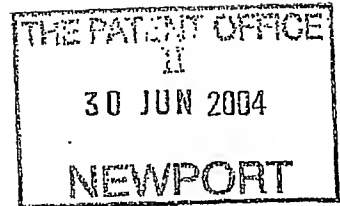
Internationale Patentklassifikation/International Patent Classification/  
Classification internationale des brevets:

B65D/

Am Anmeldetag benannte Vertragsstaaten/Contracting states designated at date of  
filing/Etats contractants désignées lors du dépôt:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LU MC NL  
PL PT RO SE SI SK TR LI



DISPENSING CLOSURE

The present invention concerns a dispensing closure, having a body and a lid. The body defines a dispensing orifice through which the contents of a container, to which the closure is attached, may be dispensed. The lid is attached to the body by a hinge, which allows the lid to swing between a closed position, in which the lid occludes the dispensing orifice, to an open position, in which the dispensing orifice is exposed and the contents of the container may be dispensed. In particular, the dispensing closure according to the present invention is a child resistant dispensing closure and includes a catch to lock the lid in its closed position. The lid can only be opened, upon application of two discrete, dissimilar movements, simultaneously by a user. This is generally considered difficult for a child to achieve and is unlikely to result in the closure being opened accidentally.

A child resistant closure of this general type is disclosed in US 4,790,442. This patent describes the need for two different and dissimilar movements to allow the lid to be opened. This patent also discusses the desirability of providing alignment between the adjacent surfaces of the body and the lid, to prevent the lid from being easily grasped to exert an opening force on the lid. In the closure described in this patent, a user must first squeeze, radially inwardly, on the two opposing sides of the lid on either side of the hinge to expose an edge opposite the hinge, by which the lid may then be

lifted. This squeezing movement may also, optionally release a catch.

The lid of the closure described in US 4,790,442 has a generally planar top plate with a downwardly depending side wall. An arcuate slot extends through the top plate opposite the hinge and adjacent to the side wall. The slot allows the side wall of the lid to be squeezed at two diametrically opposed points, thereby displacing a portion of the side wall opposite the hinge. This displacement may release a catch and also provides an overhang on the lid relative to the body, by which the lid may be lifted.

A disadvantage of this arrangement is that the distorted portion of the side wall is not supported by the top plate of the closure. The arcuate slot subtends an angle of at least  $180^\circ$ , to allow the necessary deformation of the side wall. However, during the second stage of the opening movement, a user must lift the lid by this unsupported section of side wall, which will be difficult and will result in axial movement of the side wall relative to the planar top plate. Repeated movement will lead to damage of the unsupported side wall and may render the catch (which is carried by this portion of the lid) ineffective.

A further disadvantage of this arrangement is that, unlike the side walls of the lid and the body that join in a continuous surface, the top plate of the sidewall is disjointed by the arcuate slot. This slot may collect dirt or may be used to prise open the closure using the

teeth for example, which will further reduce the effectiveness of the closure.

The closure according to the present invention, overcomes these disadvantages by providing a dispensing closure comprising a body, adapted to be connected to a container, a lid, having a top plate and an axially extending side wall, a hinge, connecting the lid to the body and arranged to allow the lid to be moved between open and closed positions, a catch arranged to lock the body and the lid together, when the lid is in its closed position, and a deformable ring, arranged to unlock the catch and provide a lifting region to allow the lid to be opened, when the ring is deformed radially, characterised in that the top plate covers the ring in both its normal and deformed configurations.

In the closure according to the invention, the top plate covers the deformable ring in both its normal and deformed configurations. The top plate of the closure has a smooth surface with no cavities therein to trap dirt or other foreign objects and cannot be easily manipulated to overcome the catch arrangement. Furthermore, the lifting region of the ring is supported by the top plate and when a user applies axial force to the lifting region to lift the lid, the ring is braced by the top plate, making the lid easier to open.

In use, a user squeezes the ring / side wall on either side of the hinge, ovalising the ring, which causes the catch to be released and also provides an overhang portion of the ring / side wall opposite the hinge relative to the body. The lifting force must be

applied simultaneously with the squeezing force required to release the catch and provide the overhang portion. If the squeezing force is released before the lifting force is applied to the lid, the catch will re-engage and the deformable ring will relax obliterating or at least minimising the overhang portion. This will make it difficult to open the lid. The two discrete, dissimilar movements, simultaneously applied, provide the child-resistance property of the closure.

The lid may be formed in two parts: A deformable ring, forming the side wall of the lid and a separate top plate. An advantage of this arrangement is that radial deformation of the ring is unrestricted. The top plate is specifically designed to cover the ring in both its relaxed and deformed configurations whilst providing a smooth surface to the top of the closure. Also, the externally facing surface of the top plate may be adapted to provide different colours, surface finish or promotional opportunities. A disadvantage of this arrangement is that it requires assembly of the two portions of the lid and this may be undesirable in a high volume production process.

Accordingly, in an alternative embodiment of the closure, the lid is produced in one-piece, with a top plate and a side wall depending downwardly therefrom. Again, the deformable ring is provided by the side wall, but in this embodiment, the end of the side wall adjacent to the top plate is constrained by the top plate, with which it is integrally moulded.

The radial deformation of the side wall / ring is thereby reduced and the lateral squeezing force applied to the side wall / ring will result in both radial deformation and axial deformation of the ring and the associated areas of the top plate.

In this embodiment, if the free edge of the side wall of the lid is contiguous with the adjacent surface of the body, the squeezing of the side wall may both release the catch, due to the radial component of deformation, and lift the lid, due to the axial component of deformation. This is clearly a disadvantage from a child resistance view point, because the lid of the closure may be opened by a single squeezing movement. A closure having this disadvantage is disclosed in US 5,683,016 (equivalent EP 0 649 380).

In the closure according to the invention, the free edge of the side wall of the lid is spaced from the adjacent surface of the body, to allow the portion of the side wall which is squeezed to deform axially as well as radially, without the side wall pressing against the base and thereby lifting the lid as the catch is released. A disadvantage of this arrangement is that the gap between the free edge of the side wall of the lid and the adjacent surface of the body may allow a child to manipulate the lid, by biting for example. In order to overcome this disadvantage, the upper surface of the body or the free edge of the lid side wall may be extended, to cover the gap between the base and the lid and prevent easy access thereto. The portion of the ring / side wall opposite the hinge is left unprotected, to allow

deformation of the ring / side wall to produce a lifting region.

Another embodiment of the invention proposes, a closure, comprising a body and a lid connected together by a hinge, with windows provided in the side wall and / or the adjacent top plate of the lid. A separate, deformable ring is fixed inside the lid and portions of this ring protrude through the windows to allow the ring to be squeezed laterally on either side of the hinge. On squeezing, the portion of the deformable ring opposite the hinge protrudes radially outwardly, through another window in the side wall, and thereby releases the catch and provides a lifting region, by which the lid may be lifted and opened.

This design may be enhanced by providing tabs attached to the deformable ring, arranged to protrude through the windows. The tabs may be further enhanced by providing with finger recesses, to improve the ease with which the ring may be laterally squeezed by a user. Furthermore, the lifting region may be provided by a further tab, which projects from the lid as the ring is deformed, to improve the ease of lifting and opening the lid, after the ring is deformed by squeezing.

This embodiment combines the advantage of a freely deformable ring, which is unconstrained by the lid or the side wall, whilst ensuring that the ring is completely surrounded by a top plate and side wall of the lid to achieve a substantially smooth surface. It will be understood that the ring and windows may be designed to

enhance the smooth, contiguous flow of the surface of the closure.

The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIGURE 1 shows an isometric view (looking from the top) according to a first embodiment of the invention, with the lid in its open position.

FIGURE 2 shows an exploded, isometric view (looking from the top) of the same closure as that shown in FIGURES 1, with the lid open and separate top plate (not yet assembled):

FIGURE 3 shows a plan view of the closure shown in FIGURES 1 and 2, with the lid in its closed, normal position.

FIGURE 4A shows a plan view of the closure shown in FIGURE 2, with the lid in its deformed position.

FIGURE 4B shows the same plan view as FIGURE 4A, with the separate top plate removed.

FIGURE 5 shows side view of a one-piece closure according to a second embodiment of the invention having a lid comprising a top plate with an integral side wall depending from the periphery thereof.

FIGURE 6 shows an isometric view (looking from the top) of the same closure shown in FIGURE 5, with the lid in its open position.

FIGURE 7 shows an isometric view of the closure shown in FIGURES 5 and 6 with the lid in its closed, normal position.

FIGURE 8 shows the same closure as shown in FIGURE 7 in its closed, deformed position.

FIGURE 9 shows an isometric view of another embodiment of the invention (similar to the closure shown in FIGURES 5 to 8), with its lid in a closed, normal position and having shield elements.

FIGURE 10 shows an isometric view the same closure shown in Figure 9 in its open position.

FIGURE 11 shows an isometric view of another embodiment of the invention, with its lid in a closed, normal position and having an alternative design of shield elements.

FIGURE 12 shows an isometric view of the closure shown in FIGURE 11, with the lid in its open position.

FIGURE 13 shows a side view of a closure according to yet another embodiment of the invention, having tabs, which protrude through windows in the side wall / lid of the closure.

FIGURE 14 shows an isometric view (looking from the top) of the closure shown in FIGURES 13, with the lid in its open position.

FIGURE 15 shows an exploded view of the closure shown in FIGURES 13 and 14).

FIGURE 16 shows a plan view of the closure shown in FIGURES 13 to 15, with the lid in its closed, normal position.

FIGURE 17 shows a plan view of the closure shown in FIGURES 13 to 16, with the lid in its deformed position.

In the attached description, the closure is described in relation to an "upright" orientation, where

the main axis of the closure is aligned to the vertical and the body of the closure lies vertically below the lid. Wherever possible like parts have been designated using the same reference numerals.

Referring to the attached Figures, a dispensing closure 1 according to the invention generally comprises a body 2 and a lid 3. The body 2 is adapted to be connected to a container (not shown) by means of mutually co-operating screw threads or snap beads, for example. Preferably, the connection between the body 2 and the container is a permanent connection, which prevents easy removal of the closure 2 from the container. Instead, the body 2 has a dispensing orifice 28, through which the contents of the container may be dispensed. The lid 3 has a top plate 31, from which a side wall 32 depends downwardly and a plug 38, designed to co-operate with the dispensing orifice 28. A hinge 5 connects the lid 3 to the body 2, and allows the lid 3 to be moved swingly between a closed position, in which the plug 38 occludes the dispensing orifice 38 and an open position, in which the dispensing orifice 28 is unobstructed and the contents of the container may be dispensed..

In a first embodiment of the invention (see Figures 1 and 2), the top plate 31 is formed as a separate component to the remainder of the lid 3, which comprises an inner central panel 33 and a side wall 32. The plug 38 is carried on the inner central panel 33.

The side wall 32 of the lid 3 is connected to the inner central panel 33 by rigid arms 35 adjacent to the hinge 5 and resilient curved arms 36 distant from the

hinge 5 (see Figures 2 and 3). The number and position of the curved arms 36 are chosen to hold the side wall 32 firmly to the inner central panel 33, and act to limit undesirable axial movement as the lid is opened and closed. The resilient curved arms provide a degree of resistance to the squeezing movement of the user required to deform the side wall 33, without preventing the deformation thereof altogether. This limited resistance is expected by a user, to provide feedback about the degree of squeezing force applied.

A separate top plate 31 is fixed to the upper surface of the lid 3 by means of a hole 332 and spigot 331 (as shown in Figure 2). The hole 332 and spigot 331 joint is designed to be permanent, once assembled and the separate top plate 31 is difficult to remove from the inner central plate 33 of the lid 3.

In this embodiment, the side wall 32 provides the deformable ring 4 and carries one part of the catch 6. The other part of the catch 6 is carried on the body 2. As shown in Figure 1, the catch 6 comprises a tab 61, which engages in a slot 62. In Figure 1, the tab is shown carried on the deformable ring 4 and the slot is defined in the body 2, but these two parts of the catch 6 may be reversed. Alternatively, the catch 6 may comprise two inter-engaging tabs rather than a tab and a slot.

Figure 3 shows a plan view of the closure 1, in its closed, normal position. As shown, in this position the separate top plate 31 covers the whole of the upper surface of the deformable ring 4. Referring to Figures 4A and 4B, to open the closure, a user squeezes the

deformable ring on either side of the hinge 5. On squeezing, the ring 4 deforms (ovalises) and thereby releases the tab part of the catch 61 from the slot 62. Also, the deformed ring 4 creates an overhang 65 on the lid 3 with respect to the body 2. This overhang 65 is used to lift the lid 3, disengaging the plug 38 from the dispensing orifice 28. It should be noted that on ovalising, the deformed ring 4 unlocks the lid but does not open the lid 3. A second separate and distinct lifting movement must be applied by the user simultaneously with the squeezing movement.

Figures 5 and 6 show a second embodiment of the invention, having the same general structure as that described above. A closure 1 comprises a body 2, for fixing to a container (not shown), and a lid 3 connected together by a hinge 5. Again the lid 3 comprises a top plate 31 with a side wall 32, depending downwardly from the periphery thereof. The side wall 32 provides the deformable ring 4 required by the invention, but in this embodiment, the top plate 31 and side wall 32 are moulded integrally (as a single component). This allows high volume production, but the integral nature of the top plate 31 and the side wall 32 means that the top plate 31 inhibits deformation of the ring 4 / sidewall 32.

In fact, it has been found that when the sides of the ring 4 / side wall 32 are squeezed by a user, the ring 4 / side wall 32 has two components of deformation. Radial deformation, which is required to unlock the catch 6 and provide the lifting region 65 required according to the invention, and axial deformation, which is

undesirable because the side wall 32 presses against the adjacent surface of the body 2 and tends to lift the lid 2. In this embodiment, this problem is overcome by leaving a gap 7 between the free edge of the side wall 32 and the adjacent surface of the body 2, which is sized such that the axial deformation of the ring 4 / sidewall 32 can be accommodated, without lifting the lid 3.

A plurality of ribs 37 are also provided between the top plate 31 and side wall 32 to allow the closure to resist any axial top load. The ribs 37 are sized and positioned to stabilise the lid 2, should it be subjected to a top load, during transport, for example.

Referring to Figures 7 and 8, to open the closure 1, a user again squeezes either side of the lid 2 to deform the deformable ring 4 / side wall 32. In this embodiment, the side wall 32 is constrained at its top edge by the top plate 31. Thus, the squeezing movement tends to push the side wall 32 radially inwardly and downwardly (as shown in Figure 8. As described in relation the previous embodiment the squeezing movement unlocks a catch (not shown in Figures 7 and 8) and also provides a lifting region 65, by which the lid 3 may be lifted.

This embodiment may be further enhanced by providing a shield 71, to cover the gap 7 and provide a smooth surface to the closure 1 (as shown in Figures 9 and 10). The shield 71 is preferably interrupted at the hinge 5 and the opposing portion of the side wall 32 (adjacent to the catch 6), to allow room for outward radial movement of the side wall 32, required to unlock the catch 6 between the body 2 and the lid 3.

In a variation to this embodiment (see Figures 11 and 12), the shield portions 71 may be extended to provide finger pads, which the user may use to indirectly squeeze the side wall 32 of the lid 3. This arrangement has the advantage that the user is unaware of the radially inward tilting of the free edge of the side wall 32 (shown in Figure 8), when squeezing pressure is applied to the pads. In this arrangement, the shield portions 71 may be relieved (for example, cut away or flared outwardly) in the vicinity of the hinge 5, to allow unrestricted opening and closing of the lid 3 on the body 2.

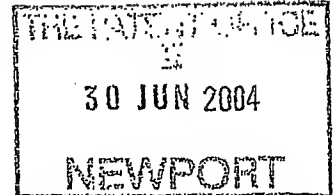
Referring to Figures 13 to 15, in a final embodiment of the invention, the lid 3 of the closure 1 is formed in one piece and is again connected to a body 2 via a hinge 5. A plurality of windows 39 are defined in the lid 2 in the side wall 32 and/or top plate 31. A separate deformable ring is assembled inside the lid 2 by a known permanent joint arrangement (eg. hole and spigot arrangement as previously described and as shown in figures 14 and 15). The permanent joint between the lid 3 and the deformable ring 4 is designed to allow free deformation of the majority of the ring 4. In other words, the ring 4 is preferably attached to the lid 2 at one point only.

A pair of squeeze tabs 41 may be carried on the ring, such that they protrude through the windows 39. Preferably, the squeeze tabs 41 are shaped to accommodate a user's fingers comfortably. A lifting tab 65 is also carried on the ring 4, opposite the hinge 5 and may

protrude through an associated window 39 in the side wall 32 of the lid 3.

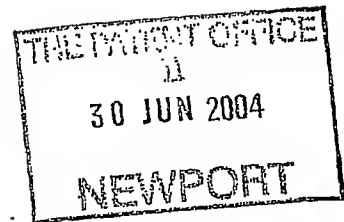
Referring to Figures 16 and 17, a user who wants to gain access to the contents of the container squeezes the squeeze tabs 41, deforming the ring 4 and unlocking the catch 6. As illustrated in Figure 17, the deformation of the ring also causes a lifting portion 65 to protrude from the lid 2, opposite the hinge, allowing the lid 2 to be lifted and thereby opened.

The examples described above are included as illustrative of the present invention only and other deformable ring designs, falling within the scope of the claims, will be ~~apparent~~ to the man skilled in the art, without departing from the general teaching of the invention.

CLAIMS

1. A dispensing closure comprising
  - a body, adapted to be connected to a container,
  - a lid, having a top plate and an axially extending side wall,
  - a hinge, connecting the lid to the body and arranged to allow the lid to be moved between open and closed positions,
  - a catch arranged to lock the body and the lid together, when the lid is in its closed position,
  - and a deformable ring, arranged to unlock the catch and provide a lifting region to allow the lid to be opened, when the ring is deformed radially,characterised in that
  - the top plate covers the ring in both its normal and deformed configurations.
2. A child resistant closure according to claim 1, wherein the deformable ring is adapted to carry part of the catch.
3. A dispensing closure according to claim 1 or claim 2, wherein the top plate and the side wall are separate components, which and are held together firmly whilst allowing radial deformation of the ring.
4. A dispensing closure according to any one of the preceding claims, wherein the deformable ring forms at least part of the side wall of the lid.

5. A dispensing closure according to any one of the preceding claims, wherein side wall of the lid is integral with the top plate and depends from the periphery thereof.
6. A dispensing closure according to claim 5, wherein the deformable ring and the adjacent body of the closure are separated by a gap, which allows the ring to deform axially without lifting the lid.
7. A dispensing closure according to claim 6, wherein the gap is protected by a shield.
8. A dispensing closure according to claim 7, wherein the shield is segmented to leave the hinge and the lifting region unobstructed.
9. A dispensing closure according to claim 4 or claim 5, wherein the side wall of the lid includes a plurality of windows, through which the deformable ring may be squeezed laterally.
10. A dispensing closure according to claim 9, wherein opposed tabs are carried by the deformable ring on either side of the hinge and protrude through windows in the side wall of the closure.
11. A dispensing closure according to claim 10, wherein the deformable ring provides a lifting tab, upon squeezing of the opposed tabs on either side of the deformable ring.



ABSTRACT

A child resistant dispensing closure 1 having a smooth external surface. The closure 1 comprises a body 2 and a lid 3, connected together by a hinge 5. The lid 3 is held closed against the body 2 by a catch 6. The closure 1 has a deformable ring 4, which in its deformed configuration co-operates with the catch 6 to unlock it and provides a lifting region 65, by which a user may lift the lid 3 of the closure 1.

FIGURE 1



Figure 1

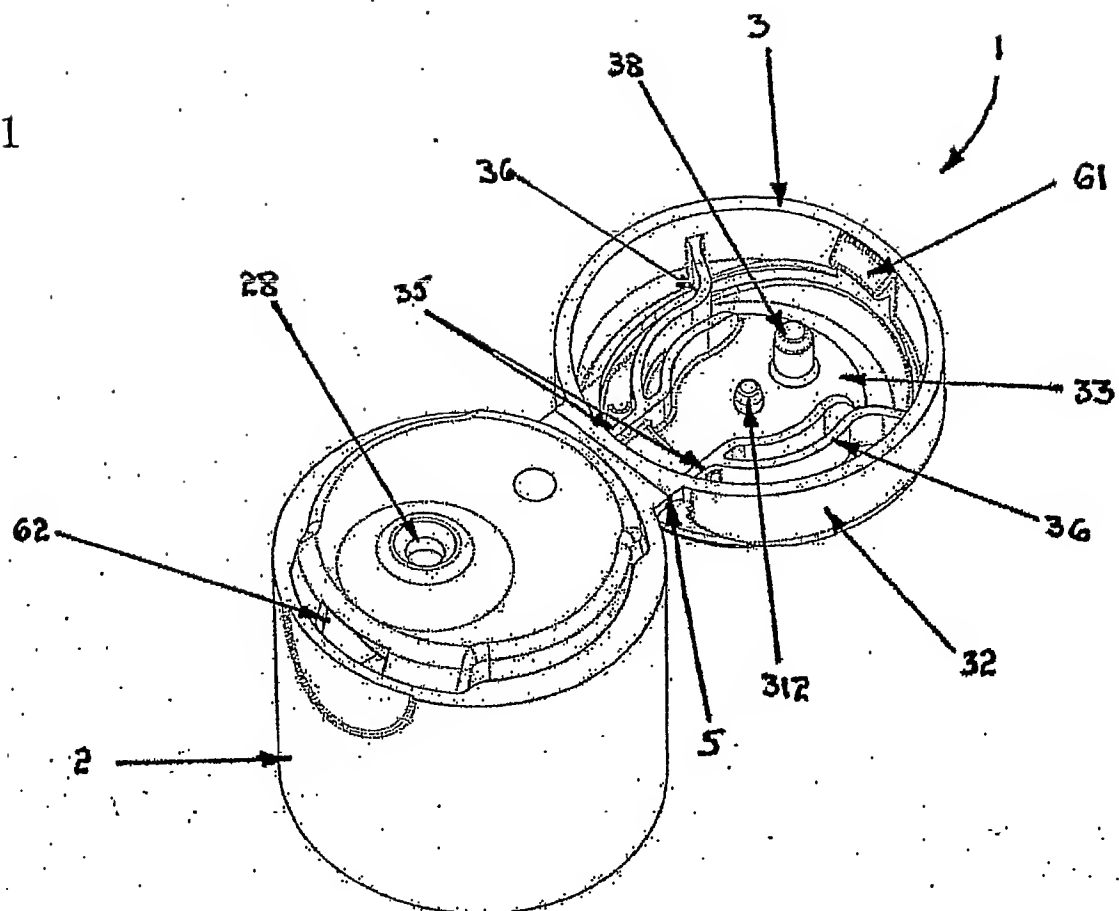
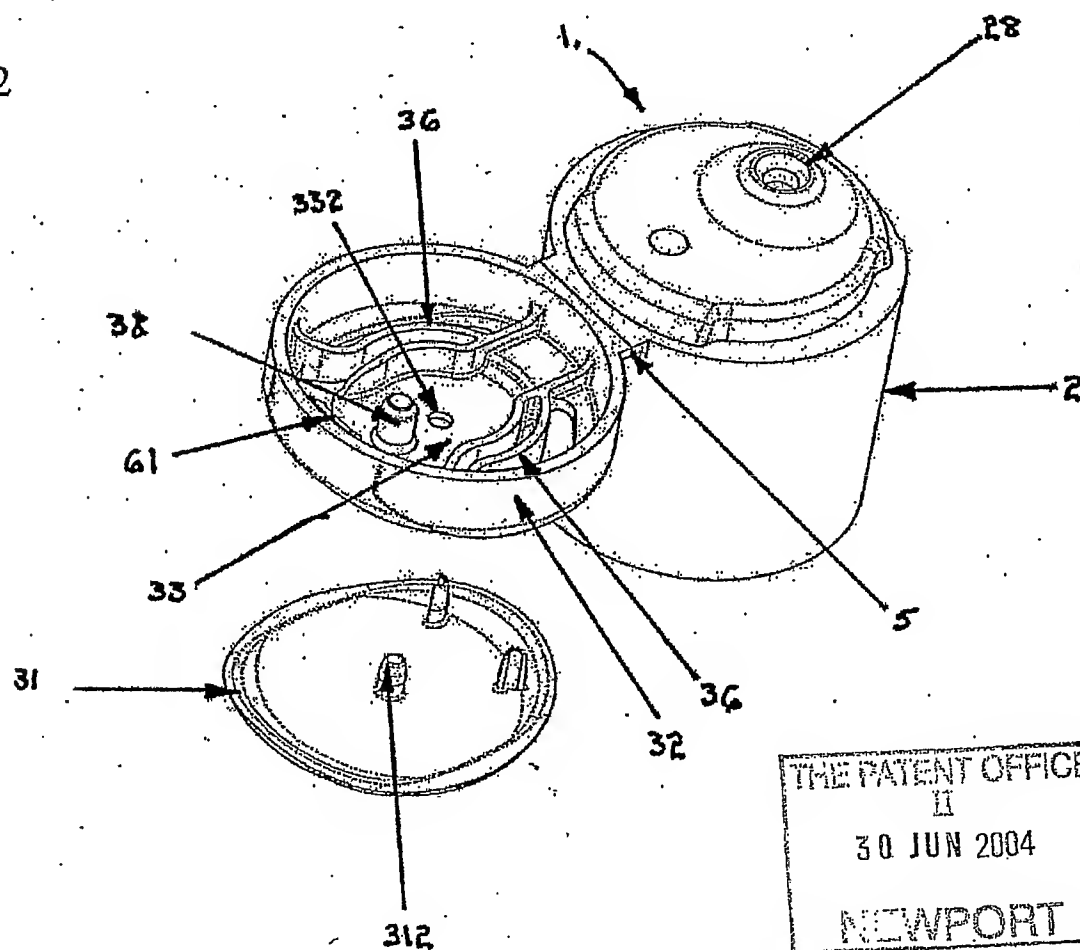


Figure 2



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Figure 3

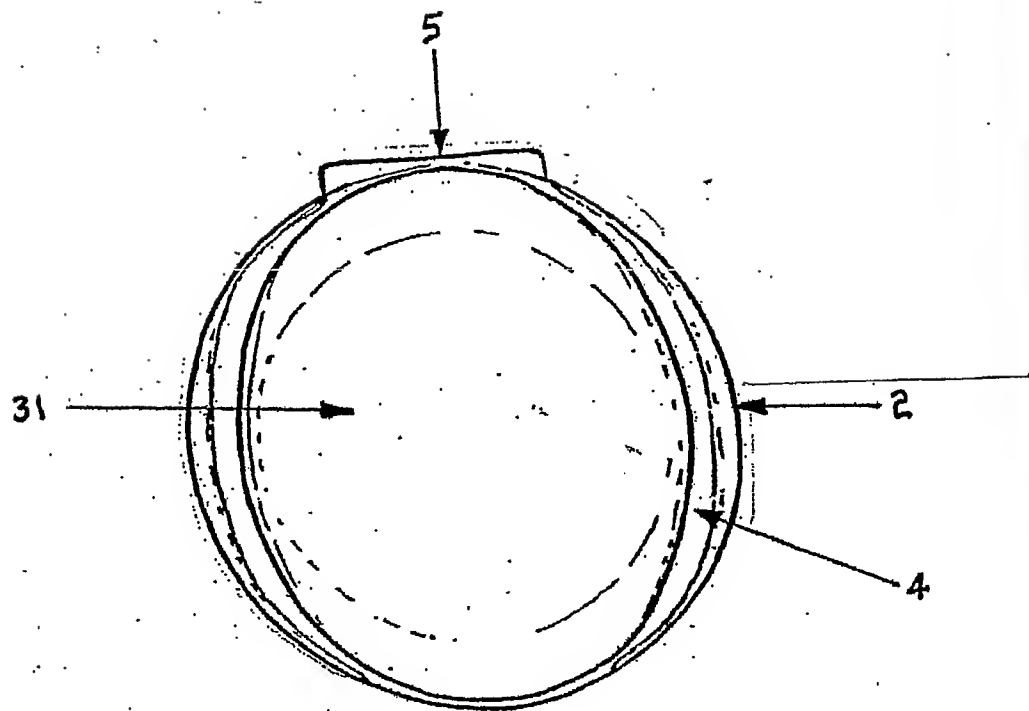


Figure 4A

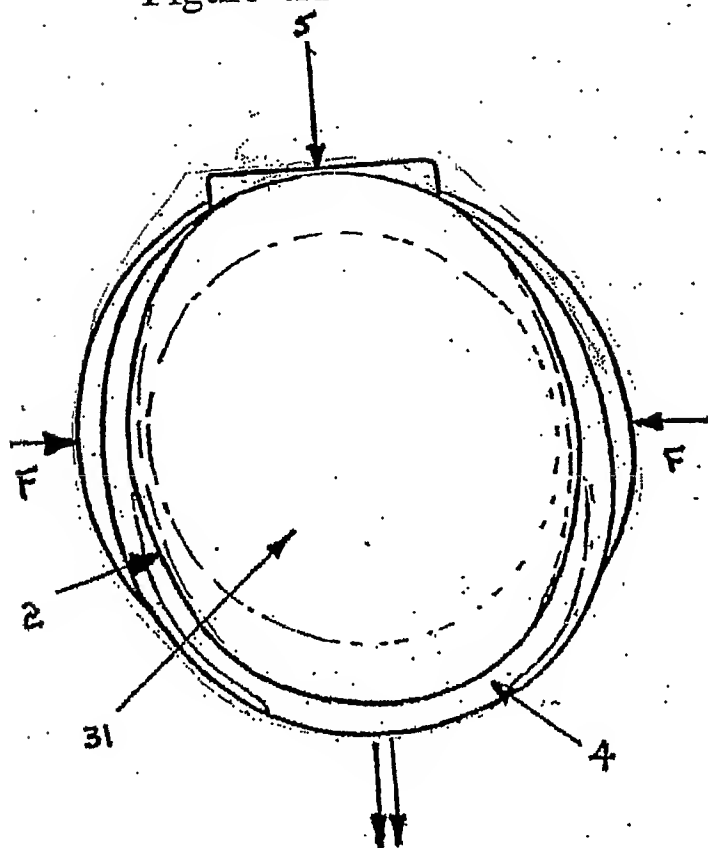


Figure 4B

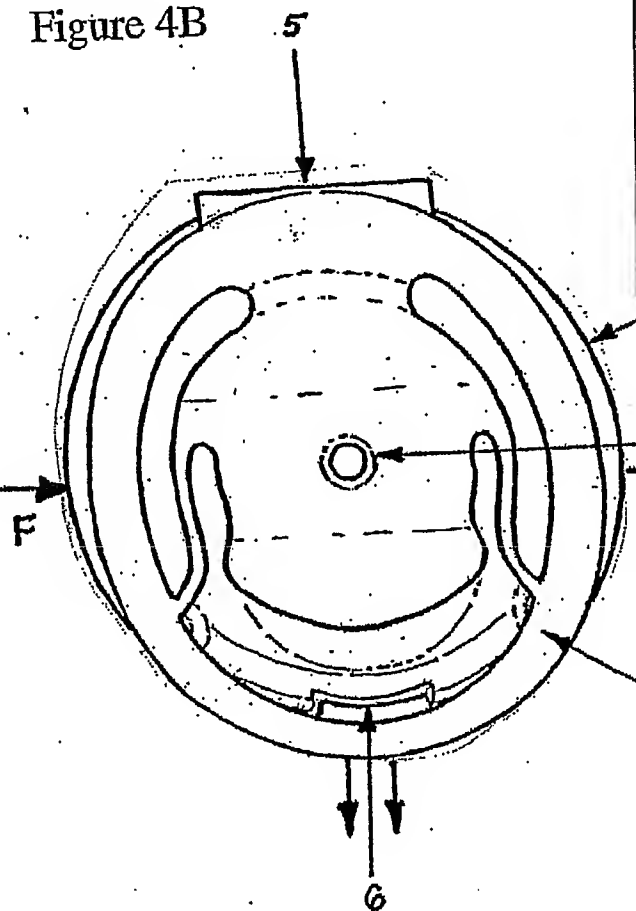


Figure 5

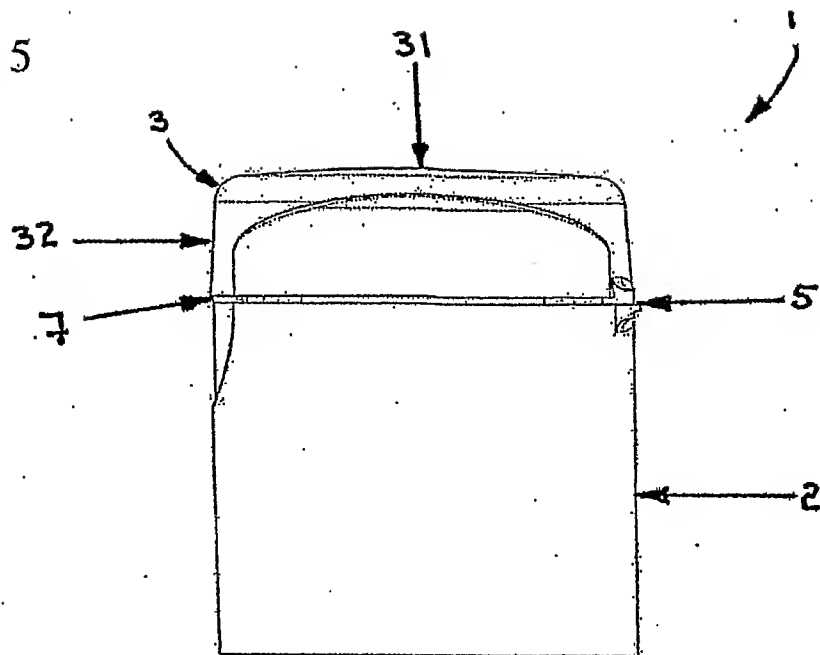


Figure 6

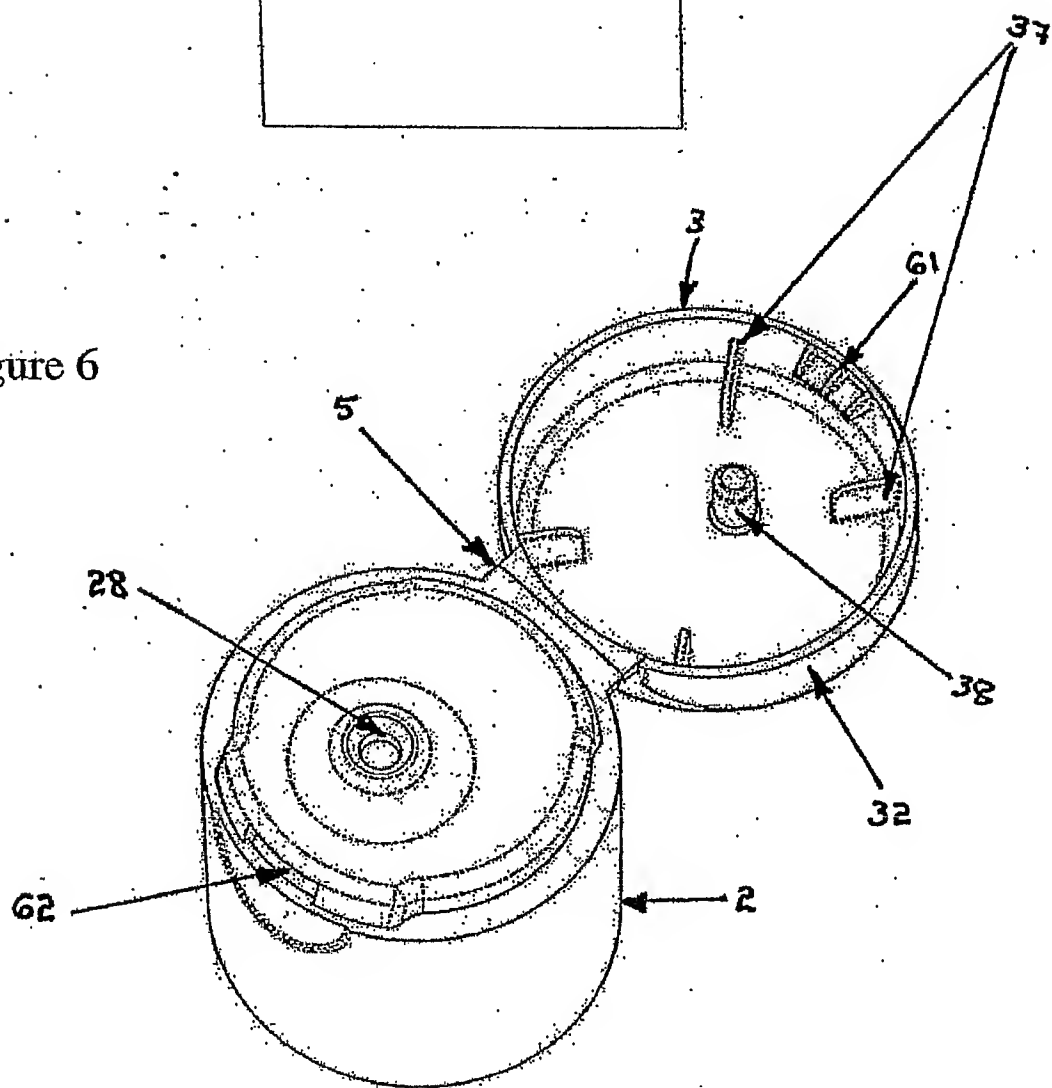


Figure 7

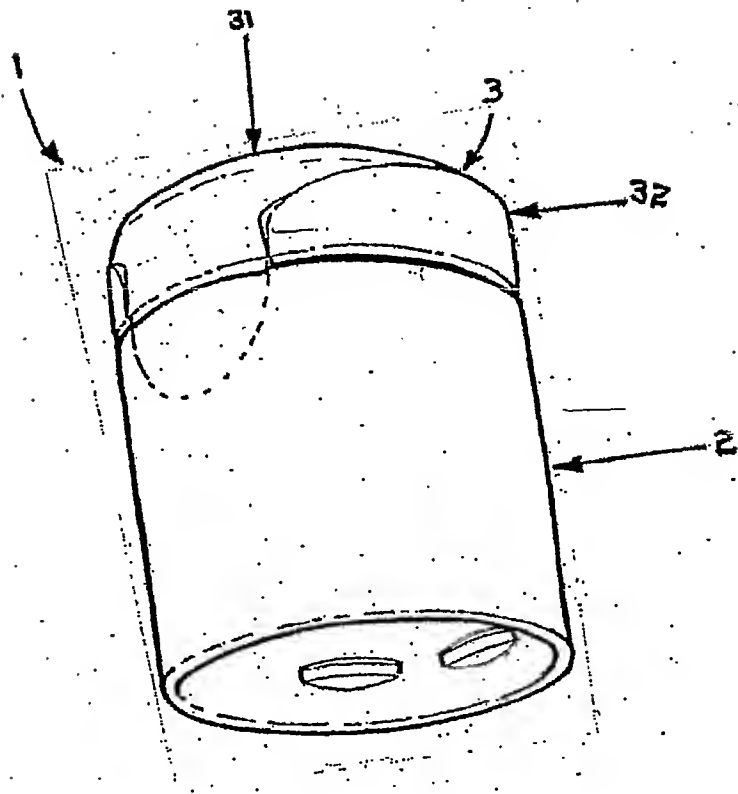


Figure 8

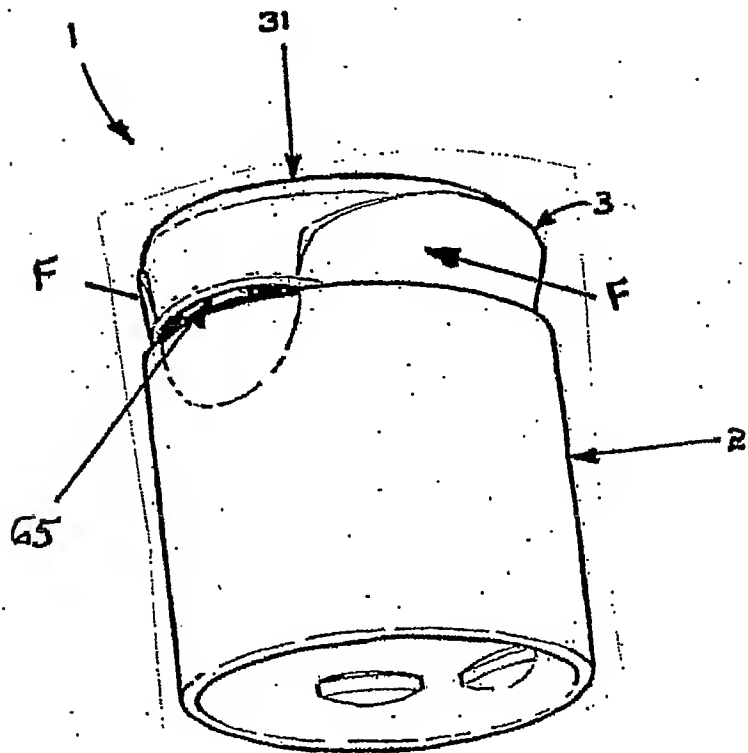


Figure 9

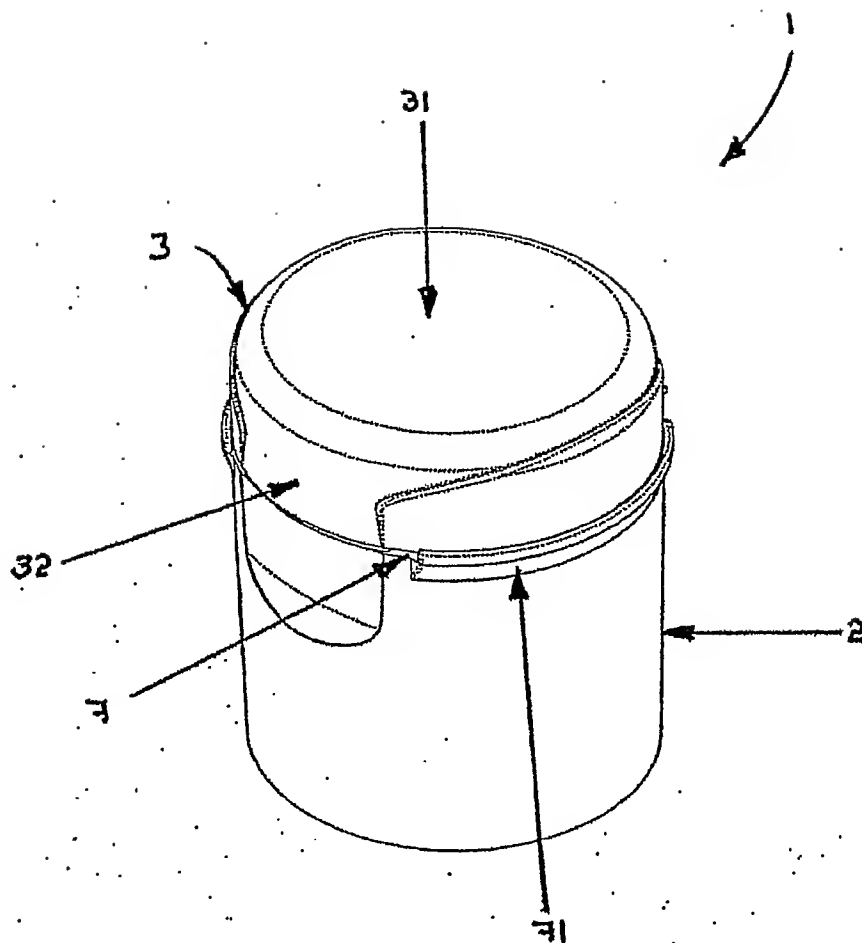


Figure 10

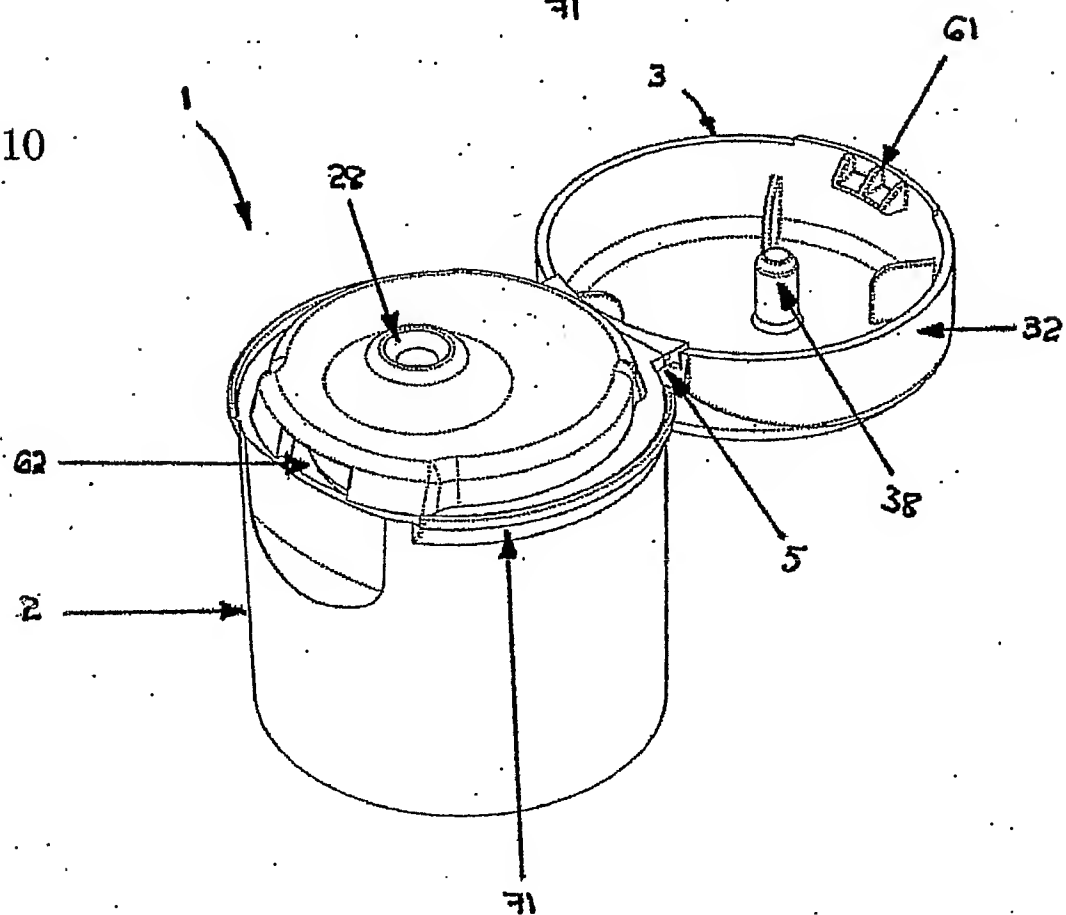


Figure 11

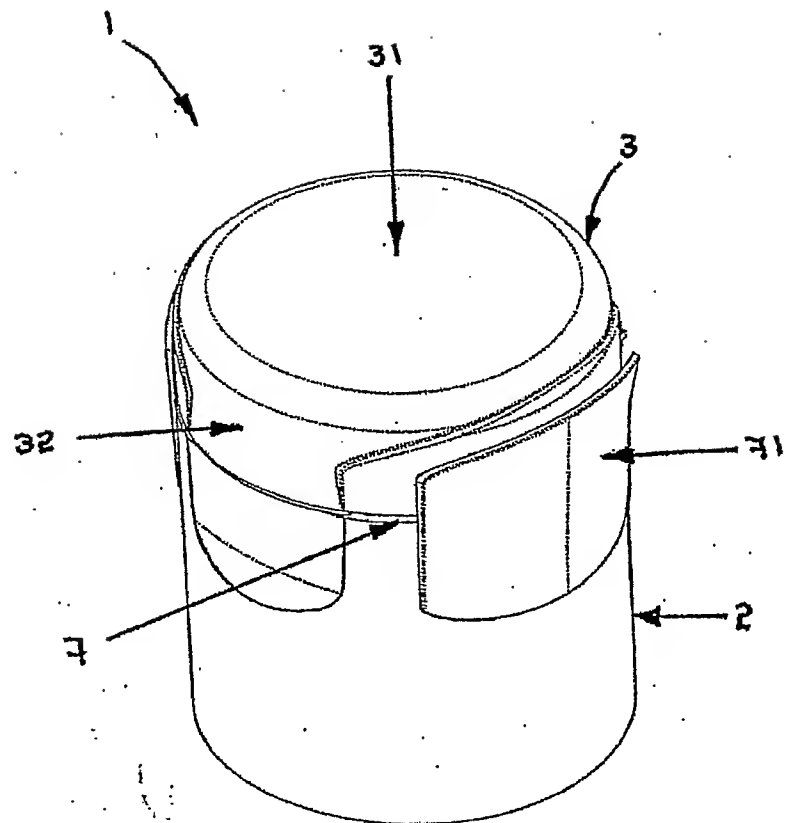


Figure 12

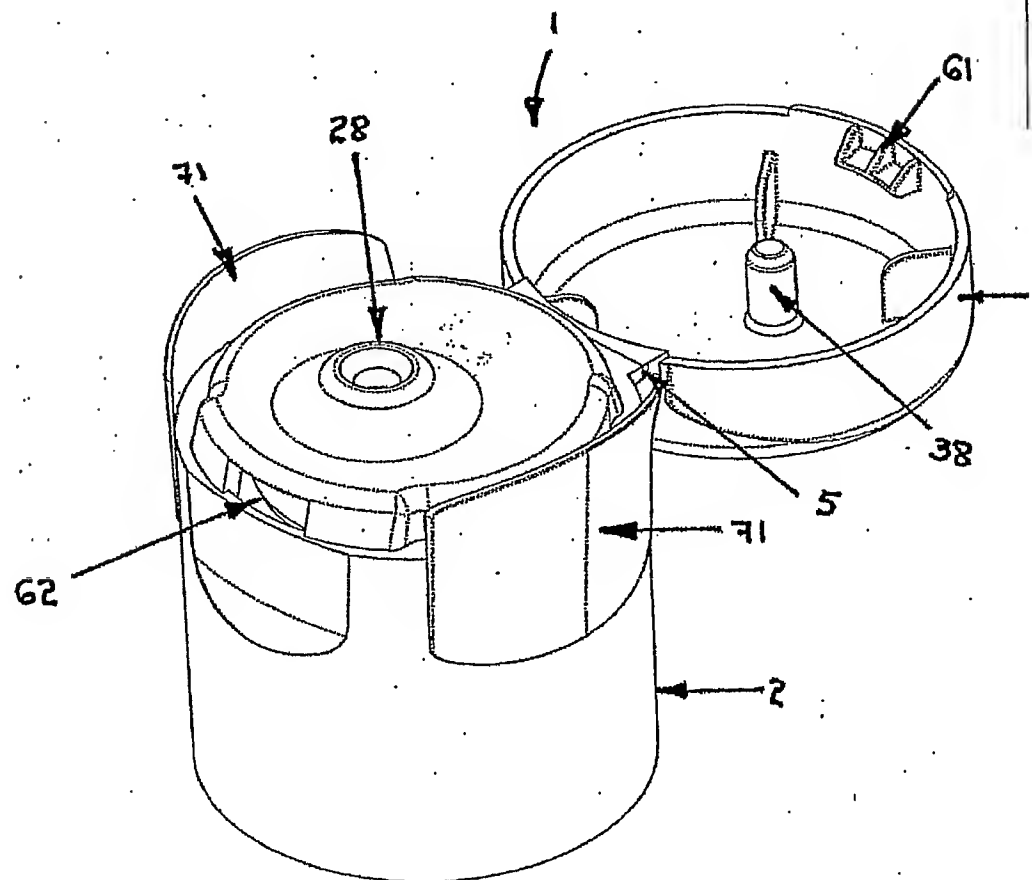


Figure 13

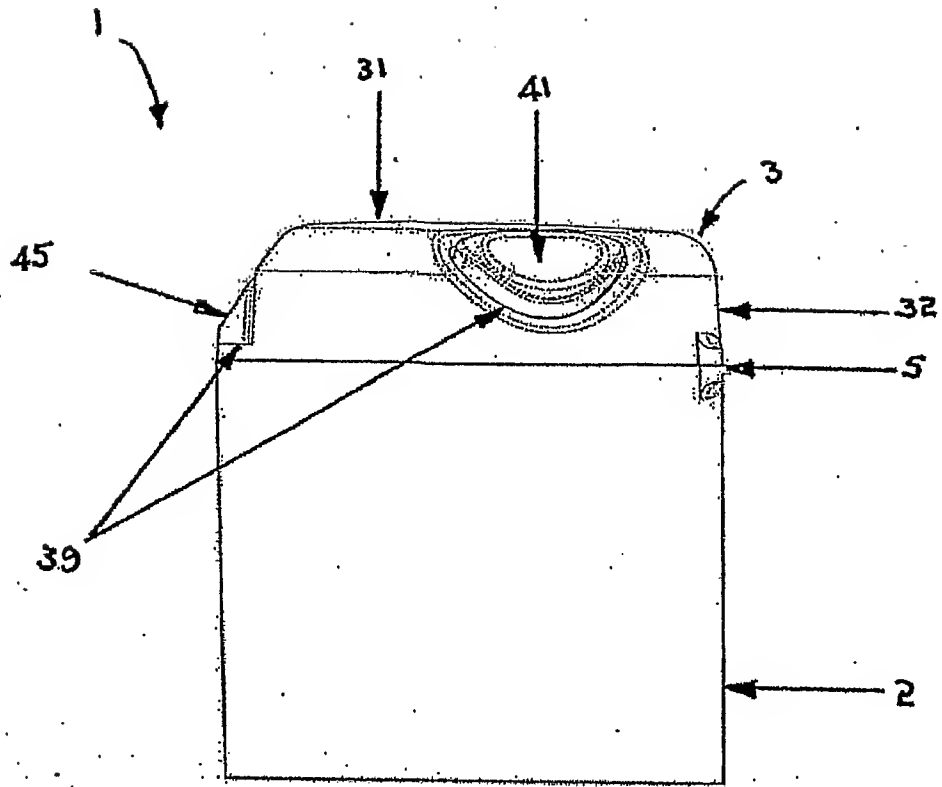


Figure 14

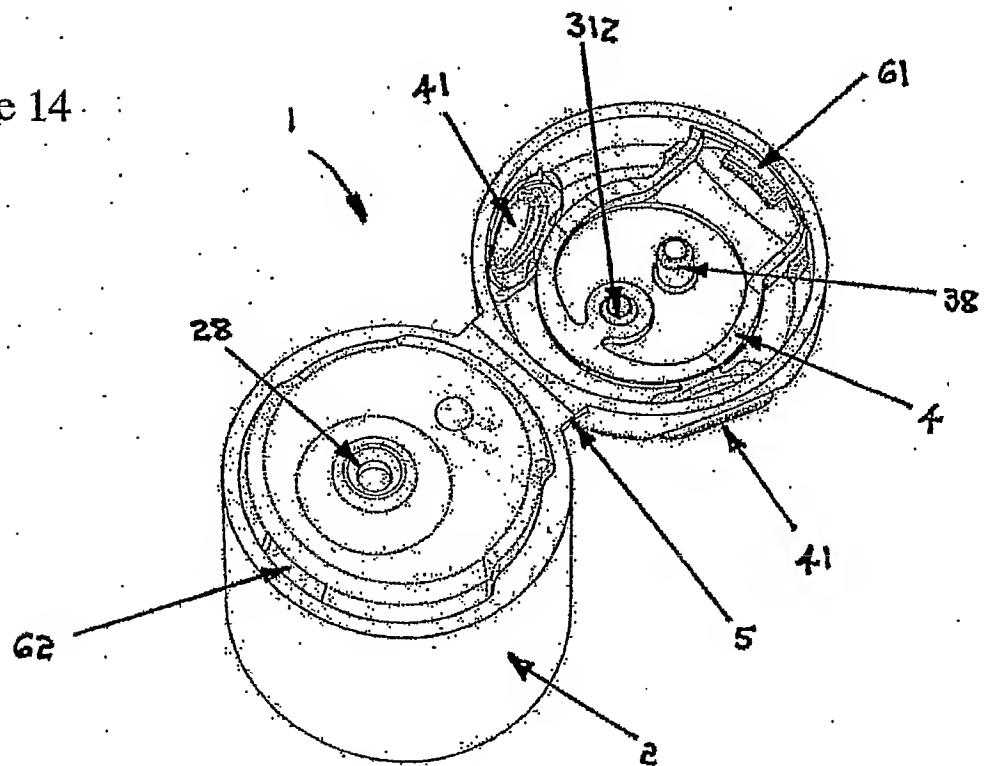


Figure 15

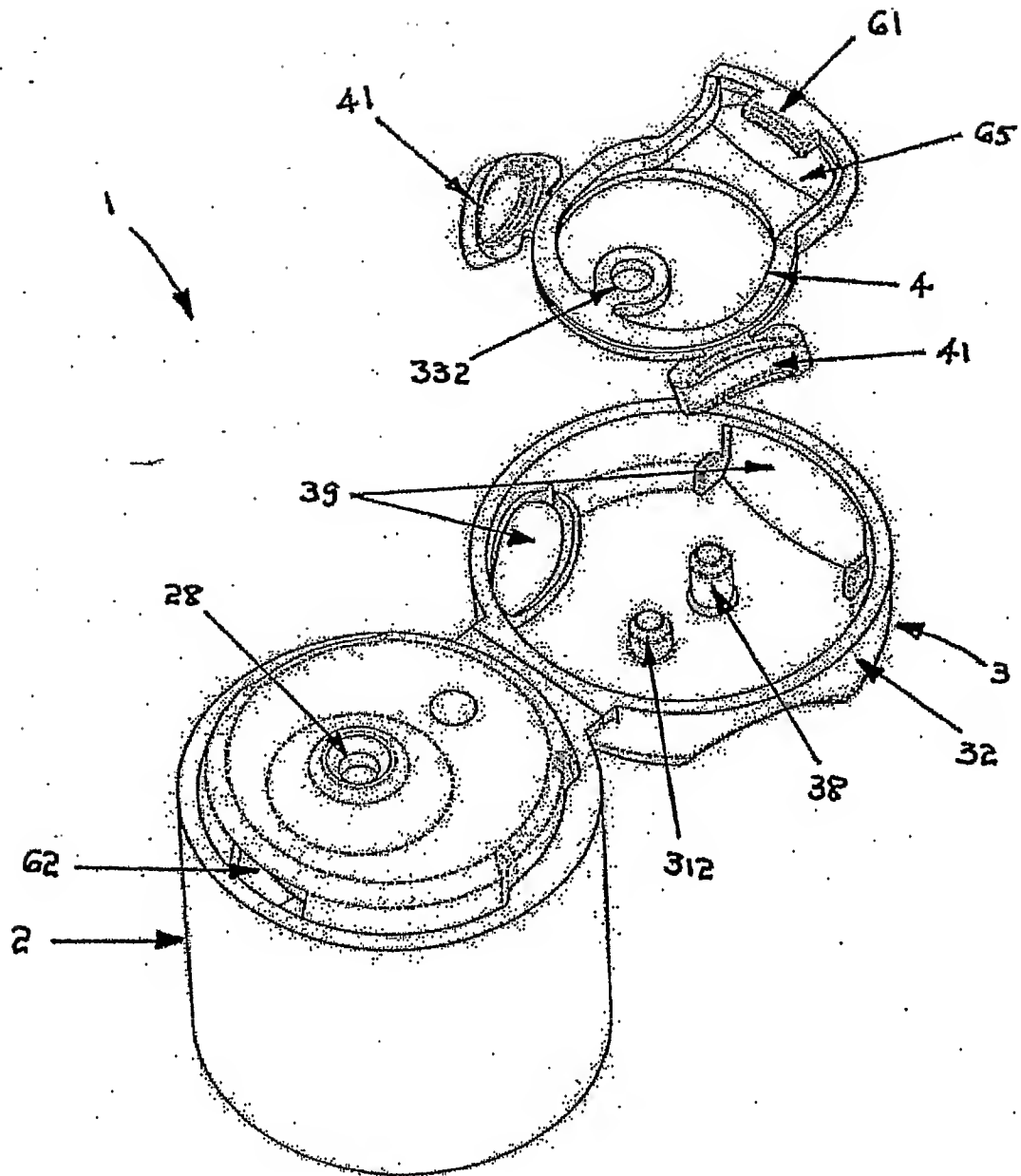


Figure 16

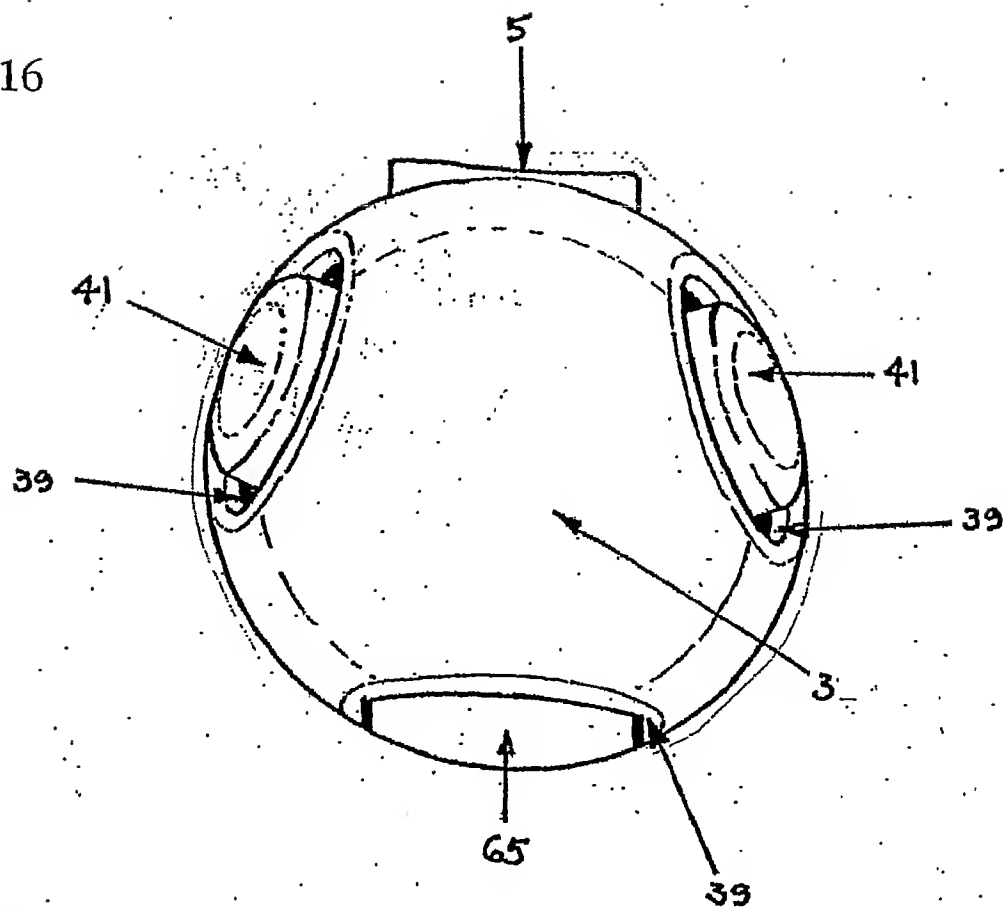
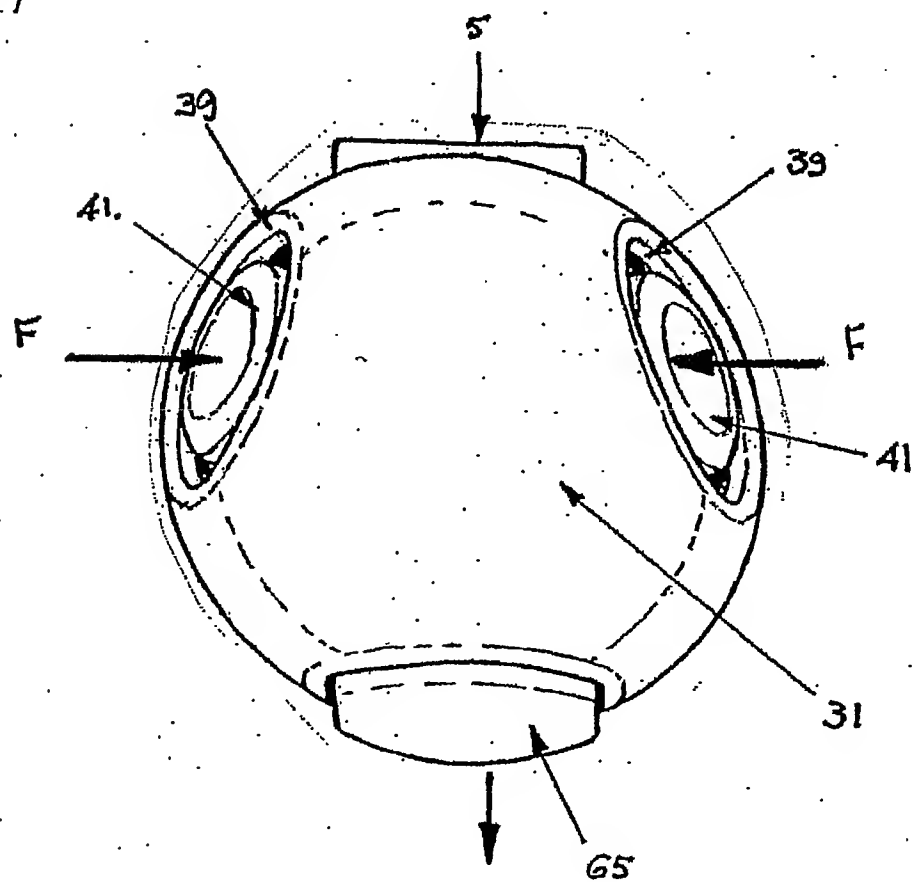


Figure 17



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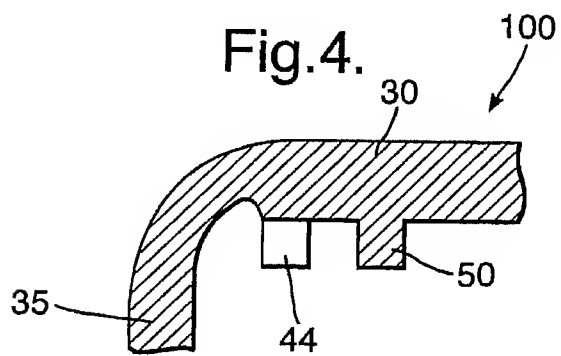
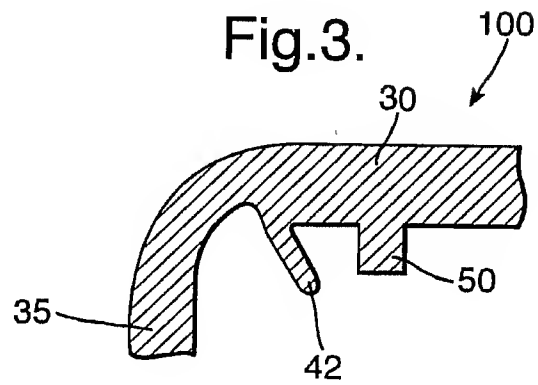
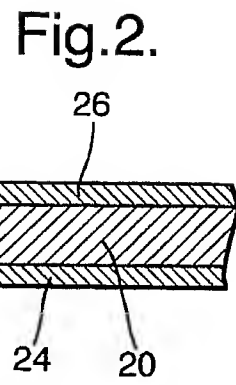
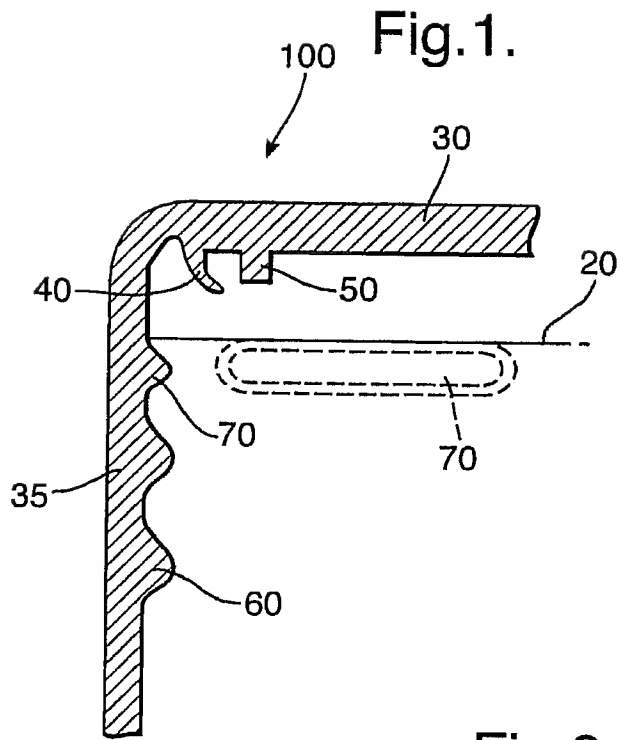
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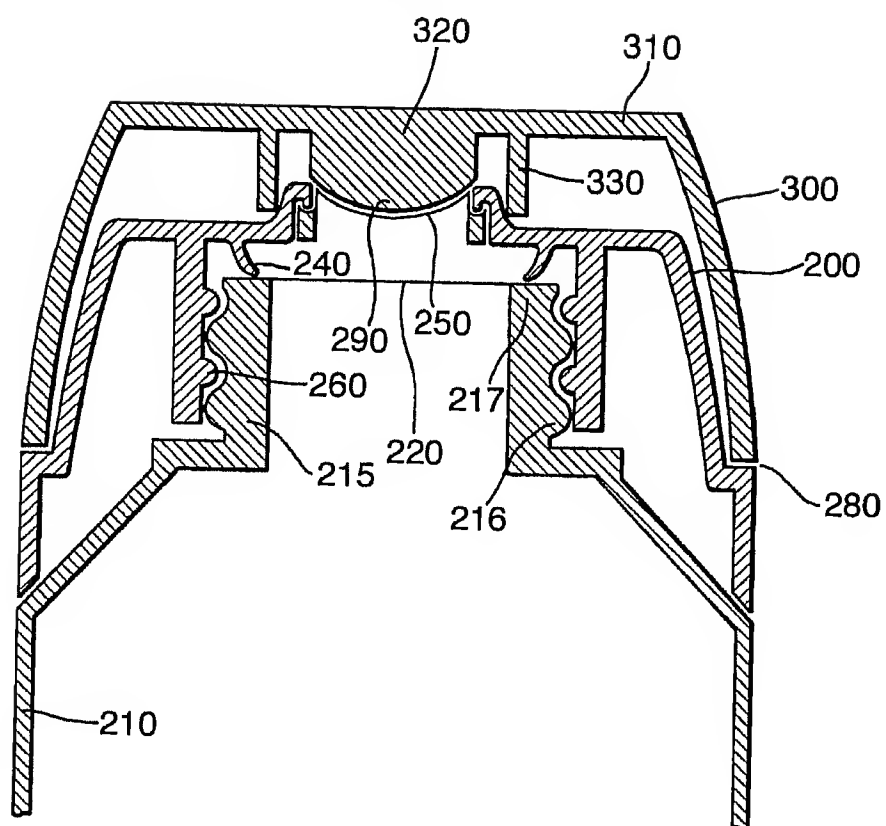
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WADLESS CLOSURE

The present invention relates to a closure, comprising a shell and a membrane, for a container and a method of sealing a container with such a closure.

5 Closures are known which comprise a membrane to be sealed to the rim of a container, overlain by a shell which protects the membrane's relatively delicate nature. Correspondingly, containers are known in association with these closures wherein a membrane has been sealed to the  
10 rim and is protected by a shell. Once the membrane is removed, the shell is then used to re-seal the container, since the shell is manufactured from a relatively good gas-tight material. This type of closure is often used for products such as coffee granules where it is  
15 necessary to have a gas-tight barrier well sealed over the container's opening to maintain shelf-life of the product. This barrier is provided by a membrane such as an aluminium foil. Once purchased, the shell is firstly removed. The foil is then also removed to allow access to  
20 the product. Since products are often not consumed all at once it is preferable that the container be closed by as good a gas-tight barrier and with as good a seal between barrier and container as possible. This is typically achieved by re-fitting the shell to the container. The  
25 shell alone is accepted as being a poorer gas-tight barrier than a well sealed membrane.

One well known closure comprises a membrane and a wad which together rest inside a shell prior to fitting to the container. The membrane and wad have an adhesive  
30 positioned between them to retain the two together. A

further layer of adhesive is positioned on the side of the membrane closest to the container, when fitted. When the shell is positioned on the container it provides a closing force which applies pressure to the further layer of adhesive and to the membrane. The layer of adhesive then adheres the membrane to the rim of the container. This may be achieved by heat activation of the adhesive layer by means of induction heating. Alternatively the adhesive may be of the so-called "hot melt glue" variety which does not require further heat for activation but rather, simply adheres the membrane to the rim of the container by means of the pressure applied by the shell.

If induction heating is employed the heating may also be employed to weaken the layer of adhesive lying between the membrane and wad. This has the effect that when the shell is removed the wad remains within the shell and the membrane remains sealed and affixed to the rim of the container.

The purpose of the wad is two-fold. Firstly, it provides a cushion-effect so that an even pressure is applied from the shell to the membrane. This has the advantage that if containers are used which have inherently uneven rim surfaces, the membrane is still efficiently adhered to the rim to ensure effective sealing. Secondly, once the membrane has been removed by the user, the wad provides re-sealing qualities against the rim of the container. This is achieved by the resilient nature of the wad. The above described closure is taught in US-A-6,277,478.

A problem inherent with this type of closure is that it is relatively expensive in that a wad and a membrane are provided.

EP-A-1211180 discloses a closure which has only a  
5 membrane and no wad. To provide a sufficient force onto the membrane to seal it to the container's rim, by means of heat induction for instance, a rib is provided on the underside of the shell. This rib is present along and above the rim of the container so that the membrane is  
10 squeezed between the two during the sealing of the membrane to the rim. However, the rib is not resilient and does not provide an even force to cater for uneven rims as maybe typically found with glass containers. Accordingly, the membrane is not always perfectly sealed  
15 to the rim of the container.

Further, in some instances there is a need for the closure to be oriented on the container in a particular manner. For example, if the closure and associated container are not circular in plan. In such a situation  
20 if the closure and container are held together by screw threads then there is a possibility, due to manufacturing tolerances in the physical size and relationship of the container and closure, that the rib will not be able to provide sufficient pressure, if any, to press the  
25 membrane onto the rim of the container during induction heating. Such a situation does not typically arise where there is no orientational requirement between the closure and container since the problem may be overcome by further twisting of the closure onto the container (so-called "torquing up").  
30

Another problem with the known rib-type closures is that since this rib is not resilient it does not provide a re-seal quality sufficient to provide a gas-tight seal to keep the product within the container fresh for a relatively long time, such as weeks or even months.

Accordingly, it would be desirable to have a closure which has only a removable membrane for providing a gas-tight barrier on manufacture, but which also has a shell with good re-sealing qualities so that after the membrane has been removed by the user, the re-seal quality is sufficient to maintain the product within the container fresh for a relatively long time. Further, it would be desirable to have a closure which provides an even pressure to a membrane so that it may be sealed effectively to the rim of an associated container.

In one aspect the present invention provides a heat sealable wadless container closure, the closure comprising a wadless membrane and a shell, wherein the membrane is adapted to be heat sealed to a rim of a container to provide a gas-tight barrier, and the shell has only a single downwardly extending resilient sealing element having a curved tapering elongate body with a base end adjacent the underside of the shell and a free end radially and axially spaced from the base end, the element arranged so that when the closure is fitted to a container the tapered free end presses against only the top of the rim of the container, to provide an even sealing pressure to the membrane during heat sealing and to provide a gas-tight re-seal once the membrane has been broken or removed, the free end of the element remaining

axially spaced from the underside of the shell when the closure is fitted to a container.

In another aspect the present invention provides a method of sealing a container with a closure comprising  
 5 the steps of moulding a shell according to any of claims 1 to 7, fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and adhering the membrane to a rim of the container by heat sealing.

Further embodiments and features of the invention are disclosed in the dependent claims attached hereto.

10 The present invention and its advantages will be better understood by referring, by way of example, to the following detailed description and the attached Figures, in which:

Figure 1 shows a cross-section of a closure  
 15 according to one embodiment of the invention,

Figure 2 shows a cross-section of a membrane according to one embodiment of the invention,

Figure 3 shows an enlarged view of a section of a closure showing one embodiment of a sealing element,

20 Figure 4 shows an enlarged view of a section of a closure showing another embodiment of a sealing element, and

Figure 5 shows a cross-sectional side view of yet another embodiment of a closure according to the present  
 25 invention.

In Figure 1, a closure 100 comprises a shell 30 which has a top plate and a downwardly extending skirt 35. In this specification, orientational words such as

4

"downwardly" are used with regard to the drawings and are not meant to be limiting.

This skirt 35 has screw threads 60 positioned on the inside and projecting radially inward. These screw  
5 threads 60 interact with screw threads (not shown)



positioned on the outside of a container's neck area so as to enable the closure 100 to be screwed onto the container.

A membrane 20 is also shown. Before being sealed to the container the membrane 20 is placed inside the closure 100 so that it initially rests on projections 70. These projections 70 exist in an annulus around the inside of the skirt 35. They may be either in the form of a continuous annulus or a discontinuous annulus. Alternatively, no projections 70 may be provided and the membrane 20 may just rest on the threads 60.

Membrane 20 lies on top of the container and provides a gas-tight barrier when adhered to the rim of the container. This is not only due to the seal between the rim and the membrane (20) but also due to the oxygen barrier qualities of the membrane (20).

From the underside of the shell 30 a downwardly extending claw-type sealing element 40 is present in an annulus around the inside of the perimeter of the shell 30. Such a claw-type sealing element is known from GB-A-2,222,821.

A stop 50 downwardly extending from the underside of the shell may also be present. This stop 50 is also annular and lies around the perimeter of the shell but radially inward from the claw-type sealing element 40.

The claw-type sealing element 40 is a rib which, in cross-section, tapers towards the end distal from the shell. It has a curved nature so that it gently curves radially inward. However, the sealing element 40 may also curve radially outward.

During manufacture, the membrane 20 is fitted inside the shell 30 and held either by projections 70 or threads 60. The shell 30 is then fitted to the container so that the threads 60 interact to hold the two together. The  
5 shell 30 may be fitted by either being pushed over the container's mouth or by rotation. If fitted by being pushed over the container's mouth, the shell will flex slightly to allow the threads 60 on the inside of the skirt to jump or pass over the threads 70 on the outside  
10 wall of the container before resuming its initial shape to ensure that the two sets of threads engage properly.

Once in place, the resilient sealing element 40 provides a force to push the membrane onto the rim of the container. The force is evenly distributed by the  
15 resilient nature of the sealing element 40 which ensures that even when containers with uneven rims are used the membrane may be efficiently sealed to the container. Typical materials used to fabricate containers which may have uneven rim surfaces are glass and metal. In the  
20 latter case, metal containers which have welded seams often have a so-called "weld-step" on the rim which can exacerbate the unevenness.

A cross-section of one type of membrane 20 is shown in Figure 2. The membrane 20 has a layer of sealing  
25 adhesive 24 shown on its lower surface. However, this layer of adhesive 24 may be provided directly on to the rim of the container, rather than as a layer with the pre-formed membrane 20. If non-heat-activated adhesive 24 is employed the pressure provided by the sealing element  
30 40 will seal the membrane 20 to the rim of the container.

However, if heat-activated adhesive 24 is employed the combined container and closure 100 are passed through apparatus which provides heat to the adhesive layer 24. One typical method is by induction-heating of the  
5 membrane 20, which then passes heat to the adhesive layer 24 by means of conduction. In this case the membrane 20 has to have at least a partial metallic composition. However, other forms of heating the adhesive 24 are known such as direct conduction heating. In addition to heat  
10 being provided, pressure is provided by the resilient sealing element so that the combination of the heat and pressure seals the membrane 20 to the rim of the container.

The heating of the heat-activated adhesive layer 24  
15 activates its adhesive qualities so that the membrane 20 is adhered to the rim of the container, thus providing an air-tight, integral and hermetic barrier. However, the adhesive may be chosen so that the membrane may be easily peeled off from the rim of the container.

20 To aid the peeling off of the membrane a tab (not shown) may be positioned at its edge. In this case the tab may either be downwardly depending from the edge of the membrane so that it is sandwiched between the two sets of threads 60, or may be bent back on itself so that  
25 it lies on the top of the membrane. Alternatively, the tab may be positioned on top and away from the edge of the membrane 20. Another possibility is that no tab exists but rather the membrane is sized so that it is slightly larger than the outer rim of the container to

provide an edge which can be gripped by the user to aid peeling off of the membrane.

The membrane 20 may also have a layer 26 on its upper surface. This layer may comprise any combination of print or lacquer and may also consist of a protective layer formed from a polymer. This layer may also be embossed.

It has been found that, contrary to expectation, the sealing element 40 is not damaged by the heating effect by, for instance, permanent deformation and therefore does not lose its resilience.

Once the user removes the shell 30 and the membrane 20, in order to access the product within the container, the shell 30 is ideally re-fitted to reduce degradation of the product by contact with the atmosphere. This is achieved since the shell 30 may be manufactured from a gas-tight barrier material and it is re-sealed to the rim of the container by screwing it onto the container. The re-seal effect is provided by the sealing element 40 interacting with the top of the rim of the container. Since the sealing element 40 is resilient it applies even pressure even onto an uneven surface such as may occur with glass or metal containers.

Further, it should be understood that the well-sealed initial membrane provides a degree of gas-tightness which is required to keep a product, on the shelf of a shop or in a warehouse, fresh for many months. Conversely, the degree of gas-tightness required after the product has been bought and opened is less since typically the product is consumed within a few weeks.

Accordingly, it is accepted that the gas-tight barrier properties of a re-fitted shell are poorer than the initial well-sealed membrane. However, it has been shown that a shell with the above described resilient  
5 element substantially improves the gas-tightness compared to the prior art.

To prevent over-tightening of the shell 30 with the container, a stop 50 may be provided as described above with reference to Figure 1. The rim of the container will  
10 meet the underside of the stop 50 and prevent the shell 30 from moving closer to the rim of the container.

It may be arranged that the resilient sealing element 40 is pinched between the stop and the rim of the container to provide a seal.

15 In Figures 3 and 4 two further embodiments of resilient sealing elements are shown. The element 42 Figure 3 takes the form of a "finger" shape. Although shown as approximately having the same cross-section along its length it could be frusto-conical in shape.

20 Figure 4 shows an embodiment whereby a block of resilient material 44 different from the material of the rest of the closure, is formed with the material of the rest of the closure using such known methods as bi-injection moulding to produce a one-piece closure. An  
25 example of such resilient material is TPE (thermo-plastic elastomer).

Another embodiment of the present invention is shown in Figure 5 and relates to closures which have to be oriented onto an associated container neck in a  
30 particular way so that the closure and container lie in a

specific orientation relative to one another. Such closures and containers are known in which the cross-sectional shape is oval. However, other non-circular shapes are also contemplated. For example, shampoo or  
5 shower-gel like containers are often produced wherein the closure fits onto the shoulder of the container such that there is an unbroken surface between the two. Of course, there could be reasons why container/closure combinations which are circularly shaped in plan may be required to  
10 have orientational relationships. Further, such container/closure combinations can of course also be used for other products such as food products.

A container 210 is shown with a closure 200 fitted. The container has a neck portion 215 which includes  
15 threads 216 on its outer radial surface. These threads 216 are for interaction with the threads 260 on the closure 200 so as to hold the two parts 200,210 together. Although not shown, it is contemplated that the closure is not circular in plan but rather is oval. Accordingly,  
20 the closure 200 can only sit correctly on the container in two positions (each 180 degrees away from the other, about an axis running through the container 210 and closure 200 through the centre of the discharge orifice 290) to produce the overall desired shape.

25 To ensure that the container 210 and closure 200 will fit together correctly and to seal the container with the closure the threads 216, 260 are carefully designed. However, due to the nature of the material used in the manufacture of the container and closure and the  
30 tolerances which are inherent in such manufacturing

processes it is not possible to guarantee a gas-tight seal between the container 210 and closure 200.

By use of the above described invention this problem is overcome and it is possible to provide this gas-tight  
5 seal after filling.

This is achieved by having a downwardly depending resilient sealing element 240 which provides an even sealing pressure to a membrane 220 which is positioned across the top and over the orifice 290 of the container  
10 neck 215. This is achieved because the resilient sealing element 240 will compensate for the tolerances of the closure/container combination. In other words, the resilient sealing element 240 will compensate for any possible gap between the underside of the closure 200 and  
15 the rim 217 of the container.

The membrane 220 is positioned and then sealed across the top of the container mouth by such methods as described above, for example by heat sealing.

Once the membrane 220 is removed by the consumer,  
20 prior to the first discharge of product from the container, the resilient sealing element 240 will also provide a gas-tight re-seal, as described above, by pressing against the rim 217 of the container's mouth. Since the sealing element 240 is resilient it will  
25 compensate for the removal of the membrane 220 even though this will slightly increase the gap between the underside of the closure 200 and the top of the rim 217 of the container.

To be able to discharge product from the container  
30 the closure may simply be removed by unscrewing from the

container. Alternatively the closure could have an orifice 290 in its upper surface. This orifice 290 would then need to be sealed in a gas-tight manner to maintain the life of the product within the container 210. This  
5 may be achieved in a number of different ways not all of which are shown in Figure 5.

For instance, another secondary closure device 300 could be associated with the primary closure 200. This secondary closure could be in the form of a cover 310.  
10 This cover 310 could be hinged to the primary closure 200, at, for example, the point marked 280 in Figure 5. Alternatively, the secondary closure 300 could have a sliding relationship with the closure 200, or simply be completely detachable.

15 On the underside of the secondary closure 300 a simple plug could be formed which would have an interference fit with the orifice 290 to seal it thereby. Alternatively, an annulus 330 could be formed on the underside of the closure 300 which would have an  
20 interference fit with the outside of the orifice 290. Of course both alternatives could be also be employed at the same time.

In one embodiment the orifice 290 may have a self-closing valve 250, such valves being well known in the  
25 art, provided. These valves typically do not provide a gas-tight re-seal without some form of mechanical interaction from a lid. Accordingly, in the embodiment with such a valve 250, as shown in Figure 5, a projection 320 is formed on the underside of the cover 310. Further  
30 an annulus 330, as described above, is also formed on the

underside of the cover 310. The projection 320 presses against, or at least is very close to, the valve 250 when the secondary closure 300 is in the closed position in relation to closure 200. This prevents the valve 250 from opening. Further, and again when the secondary closure 300 is in the closed position in relation to the closure 200, the annulus 330 has an interference fit around the outside of the orifice 290. These two mechanical means provide a gas-tight seal. Accordingly, even when the membrane 220 has been removed from the container 210 the contents of the container 210 are maintained in a gas-tight manner. This is because of the resilient sealing element 240 together with the means described above provided on the secondary closure 300.

Although the embodiment described above in relation to Figure 5 is shown with the closure at the top of the container it should be understood that in fact the closure could be situated at the bottom of the container.

With regard to the membrane 20, 220 in any of the above described embodiments, it is possible to use aluminium foil. Such foil typically has a thickness of between 9 and 200  $\mu\text{m}$ . However, other thicknesses are contemplated. Other metals and materials are also possible.

Although it has been described how the membrane 20, 220 is fitted inside the shell 30 prior to fitting the shell 30 to the container, it is also possible that instead the membrane is positioned over the rim of the container prior to the shell being fitted. In this case the membrane 20, 220 may be sealed to the rim of the

container by external pressure and/or heat supplied by the manufacturing apparatus.

Also, the closure 100, 200 has been described as having screw threads 60, 260 which interact with  
5 corresponding screw threads on the container's neck. However, screw threads are not essential since the closure 100, 200 could be snap fitted to the container by means of beads well known in the art.

Further, the membrane 20, 220 may be designed so  
10 that rather than being removable by peeling it is merely broken through so that the membrane may still be in position in the vicinity of, and on top of, the rim of the container.

Further still, the type of container with which such  
15 a closure 100, 200 may be used is not limited to glass, but may be of other typically used materials such as PET, polypropylene or metal such as aluminium or tin-plated steel.

Finally, the closure could be of the flip-top type.  
20

CLAIMS:

1. A heat sealable wadless container closure, the closure comprising a wadless membrane and a shell, wherein the membrane is adapted to be heat sealed to a rim of a container to provide a gas-tight barrier, and the shell has only a single downwardly extending resilient sealing element having a curved tapering elongate body with a base end adjacent the underside of the shell and a free end radially and axially spaced from the base end, the element arranged so that when the closure is fitted to a container the tapered free end presses against only the top of the rim of the container, to provide an even sealing pressure to the membrane during heat sealing and to provide a gas-tight re-seal once the membrane has been broken or removed, the free end of the element remaining axially spaced from the underside of the shell when the closure is fitted to a container.

2. A closure according to claim 1, including a stop being arranged to press against the top of the rim of the container to limit the axial movement of the closure relative to the container.

3. A closure according to either of claims 1 and 2, wherein the closure is designed such that it has to be rotationally oriented to an associated container in a particular manner.

10

15

4. A closure according to any preceding claim, wherein the membrane includes a metal foil.
5. A closure according to any preceding claim, wherein the membrane is between 9 and 200  $\mu\text{m}$  in thickness.
6. A closure according to any preceding claim, wherein the membrane is peelably removable.
7. A closure according to any preceding claim, wherein the sealing element is a claw-type sealing element.
8. A closure according to any preceding claim in combination with a container wherein said membrane is heat sealed to the rim of the container.
9. A method of sealing a container with a closure, comprising the steps of:
  - (a) moulding a shell according to any preceding claim,
  - (b) fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and
  - (c) adhering the membrane to a rim of the container by heat sealing.
10. A method of sealing a container according to claim 8, wherein the membrane is retained in the shell prior to being sealed to the rim of the container.

11. A closure substantially as hereinbefore described with reference to, and as shown in, Figures 1, 3, 4 and 5.

